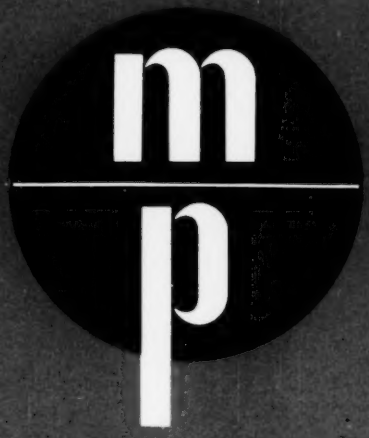
MODERN PLASTICS



SEPTEMBER 1951

It pays to use your custom molder's know-how

for the dielectric strength and stability required in aircraft disconnect panels

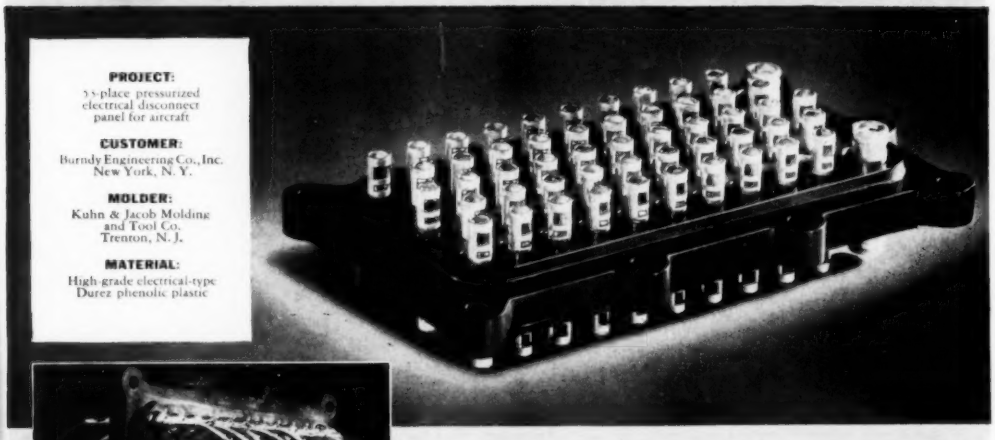
No. 29 in a Series on Plastics Skill at Work...

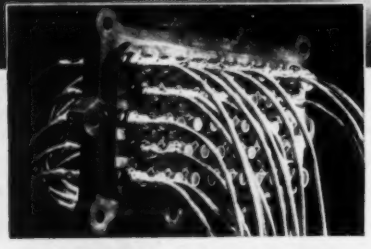
PROJECT:
53-place pressurized electrical disconnect panel for aircraft

CUSTOMER:
Burndy Engineering Co., Inc.
New York, N. Y.

MOLDER:
Kuhn & Jacob Molding and Tool Co.
Trenton, N. J.

MATERIAL:
High-grade electrical-type Durez phenolic plastic





THIS BURNDY DISCONNECT PANEL, of plunger molded electrical-grade Durez phenolic, holds 53 metal alloy socket inserts in position where controls lead from interior to exterior of aircraft. Modern molding procedures and self-insulating materials enable producers to meet increasingly high specifications in components . . . close tolerances, durability, and safety.

● The two faces of this 53-place disconnect panel live two different lives. Being inside the pressurized area of the aircraft, one face serves under the favorable conditions maintained for the comfort of passengers. But the other panel face is *outside* of this area and hence exposed to the sharply varying pressures and temperatures of substratosphere flight.

What explains its trouble-free performance under such conditions? The material itself . . . a standard Durez phenolic developed to meet unusual electrical requirements . . . and the experience and skill of the parts producer and the custom molder.

With the right Durez plastic decided upon, Kuhn & Jacob engineers were able to work out a mold design that results in "clean" molded-in socket inserts. No finishing is necessary. Proper design and production technique assure perfect contact in the precision-machined inserts, at the same time preserving the dielectric, mechanical, and surface properties inherent in this heavy-duty plastic.

Your custom molder's aim is to give you the best buy in plastics engineering, performance, and delivery speed. His unbiased recommendations on using Durez stem from long and successful experience. When wanted, the specialized experience of our field technicians is freely available.

Our monthly "Durez Plastics News" will keep you informed on industry's uses of Durez. Ask us to send a copy regularly. Durez Plastics & Chemicals, Inc., 1209 Walck Road, North Tonawanda, N. Y.

DUREZ

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- MOLDING COMPOUNDS
- INDUSTRIAL RESINS
- PROTECTIVE COATING RESINS

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"Catalin
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–The 'Weigh' to a Woman's Heart!"
To the lady-of-the-home, CATALIN STYRENE is an irresistibly attractive plastic! It is a match for gay, spirited kitchens. It is color-rich and decoratively exciting. Its beauty, in company with smart modern design and skillful molding, adds important eye-appealing extras to the utility values of a maker's product —extras that win feminine preference.
For example: The new Pelouze* household scale. This is the first of a completely re-styled series. Its dependably sturdy, and beautifully designed housing is molded of CATALIN STYRENE—in colors to harmonize with modern kitchen decorating schemes. In every detail, it takes deserving advantage of the fact that CATALIN STYRENE is indeed "the 'weigh' to a woman's heart."
*Engineered by Palma-Knapp Associates, Chicago. Produced by Chicago Die Mold Corp., Chicago, for Pelouze Mfg. Co., Evanston, Ill.
CATALIN CORPORATION OF AMERICA
ONE PARK AVENUE • NEW YORK 16, N. Y.

MODERN PLASTICS*

VOLUME 29 SEPTEMBER 1951 NUMBER 1

CONTENTS

MODERN PLASTICS BULLETIN

A Special News Service ... . Facing p. 74

GENERAL SECTION

The New Textile Fibers 75
A study of the present range of synthetic fibers and their impact on the supply of plastics

Extruded Slide Fastener 79
A low-cost all-plastic fastener is rust-proof, water-tight, and can be heat-sealed to vinyl film

Structural Board By the Mile 80
Continuous lengths of wood waste and resin board are produced by an automatic machine

Flexible Corrugated Ceiling 83
Translucent vinyl ceilings are light in weight, can be rolled up

Stud Driver Cartridges 84
Ethyl cellulose heel caps are an important component of an industrial tool

Laminates Unlimited (Part 2) 87
Mechanical applications of high pressure industrial laminates

Vinyl Blood Packs 92
Transfusion equipment made of vinyl offers many advantages over glass

A Telephone That's Tough 95
A military use of molded nylon to meet the need for rugged components

Plastics Products 96
Noteworthy items recently placed on the market

Acetate Display 174

Jacket Welting 176

Tinted Safety Glass 178

Heat Tubing 180

Soil Fumigation Cover 182

Transistor 185

Cast Plastic Lens 188

PLASTICS ENGINEERING

Curing RF Heater Television Interference 101
by P. S. Rand, J. J. Lamb, and A. J. Riley
A practical low-cost way to operate RF equipment in accordance with new F.C.C. regulations

TECHNICAL SECTION

Effect of Orientation on the Mechanical Properties of Polystyrene 113
by R. G. Cheatham and A. G. H. Dietz
Tests were made in tension, flexure, and torsion at varying temperatures and strain and load rates

DEPARTMENTS

U. S. Plastics Patents 130

Plastics Digest 140

New Machinery and Equipment 152

Books and Booklets 158

International Plastics News 168

Production of Plastics Materials 172

THE PLASTISCOPE 196
News of the Industry; Predictions and Interpretations; Company News; Personal; Meetings

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How to get the most out of MOLDED PHENOLICS

Of all the plastic molding materials available today, none are more widely used, nor to better advantage, than the tried and proven phenolics. Though among the oldest of today's plastics, they are always new and ready for the demands of modern industry. New formulations and new types of filler are constantly being introduced to provide new and desirable qualities.

For example, the medium-impact group is extremely popular. It offers excellent resistance to moisture and mild alkalis, good impact and structural strength, ready moldability, good electrical properties, and excellent finish. These phenolics have proven ideal for such widely used applications as washing machine agitators, special types of electrical parts, pump impellers, tool housings, and scores of other equally practical working units. A few of them are shown here.

The secret of getting the most from these and other phenolics is simply a matter of choosing the right plastics molder . . . one like Chicago Molded, for instance. We've been dealing with phenolics in all their widely varied forms for more than 30 years. This know-how, together with our unexcelled production facilities, is your insurance of consistently dependable results.

This is important, too. We mold *all other* commercial plastic materials as well. So . . . whether your job calls for thermosets or thermoplastics . . . urea or styrene, melamine or acrylics . . . we mold them all. Thus, you'll find here a thoroughly unprejudiced viewpoint whose one concern is to help you get the most out of your molded plastics job. That, perhaps, is one reason why more than 60% of our business comes from firms whom we have served for 15 years or more . . . and why you'll find this a good place to come for molded plastic parts.

If you would like interesting information about phenolics and other molded plastics, write for our fact-filled book, "The Story of Plastic Molding." But if you have an immediate application for plastics we invite you to discuss it with a Chicago Molded engineer. Just write, wire or phone; no obligation.

The above expertly molded of medium-impact phenolics by

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CUSTOM MOLDERS OF ALL PLASTIC MATERIALS

EDITORIAL

You Asked for It – Here It Is

To a number of our readers the receipt of the "Modern Plastics Encyclopedia and Engineer's Handbook" as a bonus in the same package with this issue of MODERN PLASTICS will come as a surprise.

To those we say: "You asked for it. We believe you will find it useful." And we say this because the latest edition was planned only after a careful survey of the requirements of subscribers to the magazine and purchasers of the Encyclopedia.

It is not usual for publishers to editorialize in explanation of their own actions, but in this case we feel that readers' attention should be called to the expanded service which has been made possible by this particular action.

We have always preached to the Plastics Industry and to end users of plastics that their duty is to keep modernizing, to keep lowering costs, and constantly to expand their individual scope of usefulness. So we practice what we preach. The concentrated new-style issue which came to you with this magazine has a circulation of more than 24,000, or twice that of the previous issue. By eliminating the fancy, heavy cover, by leaving in the library all basic textbook information on plastics and their origins, by directing this 1951 "Modern Plastics Encyclopedia" exclusively toward new developments recorded since the publication of the 1950 edition, we have been able to make it vastly more useful in more ways to more people.

To those readers of the magazine who have not been acquainted with the "Modern Plastics Encyclopedia," we point out that it can be put to work for them every day. To end users of plastics, to manufacturers using custom services and plastic components, it is intended to be especially useful.

But it is not a textbook. The basic information on the history, chemistry, and processing of plastics materials is recorded in 14 past editions of the Encyclopedia and in past issues of MODERN PLASTICS magazine. Photostats of any such matter may be obtained at a nominal charge.

In the present hectic period, when alternates for scarce materials are being considered, when plants are being expanded, when new and faster methods are being studied, a concentrated source of the latest information on all phases of plastics is desired. And in this defense economy, when some military and government business must be the responsibility of every plant in the land, concise information on the activities and intentions, as well as the executive setups in the military services concerned with plastics, is required. That is what surveys showed that you want. That is what we give you herewith.

Keep the "Modern Plastics Encyclopedia" close to hand. You'll refer to it a thousand times in the next 12 months. When you first open it, read "How to Use This Book," beginning on page 3. From then on, you'll find it easy to locate the required information.

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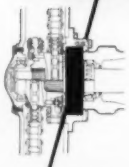
This rugged motor grader, made by Caterpillar Tractor Co., Peoria, Illinois, features a tandem-swing drive in its rear wheel design which gives it great traction and grade accommodation.



INSUROK

T-602

stands up where metals fail!

Graphited plastic laminate eliminates sleeve trouble in "Caterpillar" Motor Grader

On their Motor Grader tandem-drive housing pivot bearings, Caterpillar Tractor Co. experienced premature sleeve bearing wear. These bearings are subjected to intermittent oscillating motion and are difficult to lubricate. Field reports showed that metal sleeves became scored after only 300 to 600 hours of operation.

Richardson engineers recognized this as an ideal job for INSUROK, Grade T-602. In such difficult bearing applications, this self-lubricated graphitized phenolic laminate provides just the right combination of properties for long, trouble-free service. Result for "Caterpillar": three years of use—no trouble reports!

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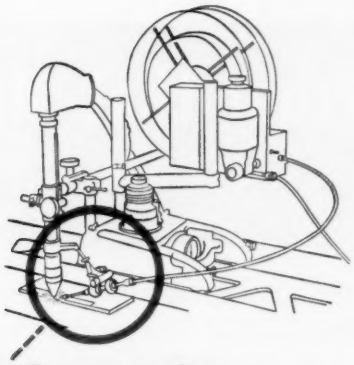
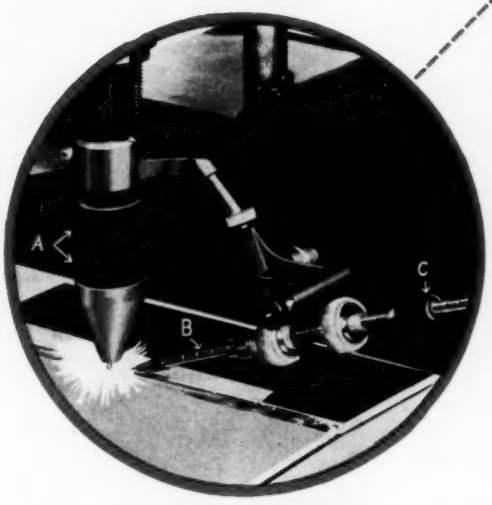


Du Pont "Teflon" withstands high frequencies



"HELIWELDING" is a process of Air Reduction Company (Incorporated), N. Y. Current and gas are delivered to arc through holder. Chuck nut adapter machined of "Teflon" (A) insulates current and heat. Filler wire is fed off a reel through feeder tube (B), lined with nylon for abrasion-resistance. Bushings (C), washers and sleeves of nylon used throughout feeding equipment. Nylon tube made by Polymer Corp., Reading, Pa.; nylon parts molded by Sameric Engineering Co., Riverdale, N.J.

resists temperatures as high as 400°F. in arc welding process

This welding process successfully joins hard-to-weld metals—stainless steel, aluminum, brass—by using an inert-gas-shielded arc to produce pinpoint heat concentration and freedom from oxidation.

Two parts made of Du Pont "Teflon"* tetrafluoroethylene resin (a chuck nut and nozzle adapter) are used on the machine electrode holder that delivers inert argon or helium and current to the welding arc. "Teflon" more than meets electrical requirements: insulation against frequencies of 3 megacycles and voltage of 3,000 volts, and it is unaffected by the temperatures, which reach 400°F. The parts of "Teflon" are extremely tough and durable.

Du Pont nylon plastic plays a key role, too. The filler wire is delivered automatically off a reel and fed into the arc at speeds of 150 inches per minute and greater. When this wire is aluminum or magnesium, a tube of nylon is used to line the flexible hose through which the wire passes. Also, bushings and washers are molded of nylon. Nylon, with its low coefficient of friction and excellent resistance to wear, withstands the highly abrasive action of these metals.

Demand for "Teflon" and nylon currently exceeds supply. However, we suggest you investigate their versatile properties for future application. We will gladly discuss the availability of quantities for development work. For additional information on Du Pont plastics, write:

*REG. U. S. PAT. OFF.

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Proof that METASAP STEARATES MEAN BETTER MOLDING

Here's proof, in 3 pictures, that Metasap Stearates can help you do an excellent molding job:

Picture 1 shows a preform such as no molder wants. It was obtained during extensive tests run by the Watertown Manufacturing Company, and proved typical of a large number of preforms molded from compounds that did NOT contain Metasap Stearate as lubricant. Such preforms required an average pressure of 50 lbs. to eject them from the mold, and an unprofitably large percentage were delaminated in the ejection process.

Picture 2 shows a typical preform obtained, during the same tests, from molding compounds containing Metasap Calcium Stearate. Perfect in shape, such preforms required only 10 lbs. of pressure to release them from the mold.

Picture 3 shows how early in the manufacturing cycle the advantages of Metasap Stearates can be realized. In rolling sheets of molding compound (prior to grinding for powder) the inclusion of a Metasap Stearate aids in preventing the material sticking to the rolling mill.


1


2


3

Photos courtesy of Watertown Manufacturing Co., Watertown, Conn.

ADD IT ALL UP—and the answer is plain:

Lubricating with Metasap Stearates assures—

Improved Preforms—without delamination . . . since high ejection pressures are unnecessary.

Improved Finished Products—clean cut, with more marketable finish.

Increased Output—Rapid, easy ejection avoids waste of time and effort—assures fewer rejects.

Increased Economy—Preform molding can be done with machines of less tonnage. Molding materials are conserved. Mold life is increased—because scoring is virtually eliminated.

Metasap Zinc and Calcium Stearates, for use in molding plastics, assure significant manufacturing economies all along the line—and better products, too. Today, when you must produce *quality* and sell *competitively* you'll find Metasap stearate lubrication an indispensable aid to more profitable operation.

For complete information, write

METASAP CHEMICAL COMPANY, HARRISON, N. J.

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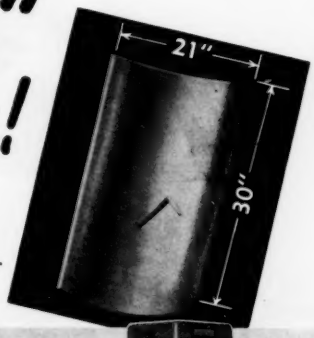
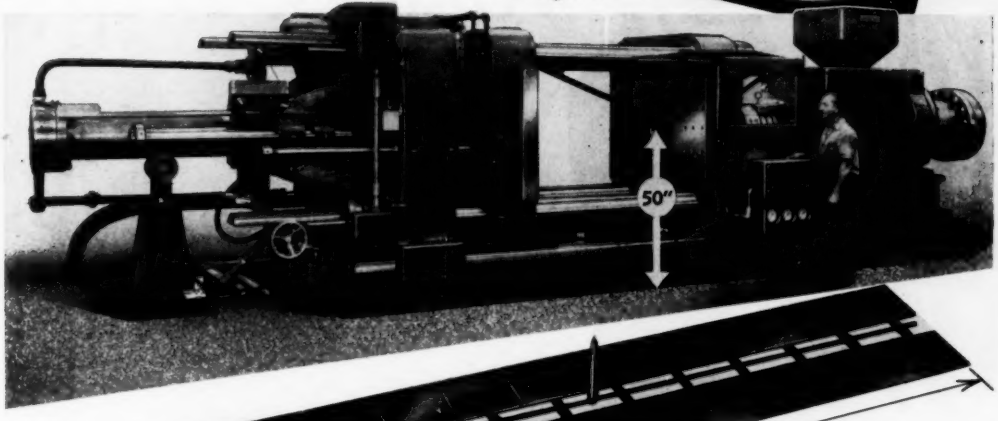
Stearates

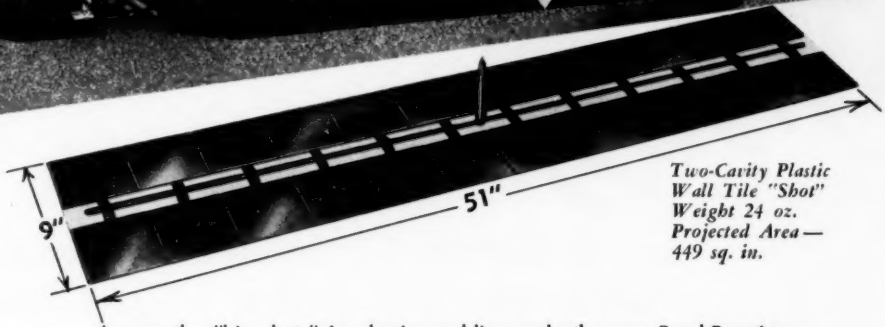
of Calcium • Aluminum • Lead • Magnesium • Zinc

"Big Shots" in the plastic picture!



Wurlitzer Juke Box Shield Projected Area — 630 sq. inches Weight 64 oz.





Two-Cavity Plastic Wall Tile "Shot" Weight 24 oz. Projected Area — 449 sq. in.

Among the "big shots" in plastics molding, only the *new* Reed-Prentice 1200T-200 oz. Injection Molding Machine offers the unmatched dependability and performance that have earned "Reeds" a reputation second to none in the field. The 1200T-200 oz. machine — with 60 x 72" die platens and 1200 tons clamping pressure — assures rapid production of large plastic parts such as those shown here. This press is completely engineered for ease of operation and maintenance. The distance from the floor to the center of the heating cylinder — only 50 inches — permits utmost accessibility to molded pieces. Write today for new descriptive circular.

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BPM **Bridgeport Moulded Products, Inc.**

BOX 3276, BARNUM STATION BRIDGEPORT, CONN.

There's no mystery behind MPM production magic

MPM 3½" extruder for nylon, Kel-F, polystyrene, acetate, methacrylate, polyethylene, polyvinyl chloride, formvar and many other thermoplastics.

You don't have to backtrack to potions or hocus-pocus to discover why MPM extruders do such an outstanding job of producing quality extrusions at fast rates. The answer lies in several specific features which are described here for your information.

heat control MPM extruders are designed for heating by electricity only. Heat input is controlled to the heating zones of the cylinder and die-head. Each MPM machine is equipped with a large number of radial cooling zones for removing excess frictional heat.

screw design The screws of MPM extruders are designed to provide a maximum of even thrust of material. The screws are cored for heating and cooling, and a tachometer constantly indicates rpm's.

resistant materials All parts which come into contact with plastic resins are constructed entirely of corrosion and abrasion resistant materials. No platings are used for strainers, cylinders, screws or other vital components. Long service is built-in.

safety die-head Exclusive MPM splitring die-head construction protects screws from breakage better than ever before. Dies for wide film, covered wire, monofilaments and other products extrudable on MPM's are also given an added measure of safety.

MPM extruders are the choice of many of the best informed, most experienced technicians in the extrusion field. Almost every major material supplier in the country owns one to six or has ordered these machines.

There are additional features of MPM extruders which we will gladly discuss with you in detail. Let us know what you want to produce and we'll be specific in our reply. Address letters to W. J. Johnson.

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2325 Josso Street, Los Angeles 23, Ca.

modern plastic machinery corp.

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Cable Address: MODPLASEX

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THE SHORTEST DISTANCE BETWEEN PRODUCTION AND PROFIT

In a fast-paced industry like that of plastics molding, news becomes history almost over night. Only a few years ago, W-S was pioneering the "big" injection machines—eight, then 12, then a fabulous 16 ounces! Now, Watson-Stillman's high-speed production giants—the size of small locomotives — shoot almost 20 *pounds* per cycle.

Yes, plastics molding has come of age. What started only yesterday as a manufacturing business has become a major industry . . . its applications tested and proved . . . its markets huge and growing . . . its materials and products pronounced "critical" in the most vital fields of civilian and defense production.

W-S is proud of its right to claim an associate editorship in the "writing" of this typically American success story—the encyclopedia of plastics molding. We have worked closely with its chief editor—the molder himself—in developing the most complete line of production machinery anywhere available.

Always reflecting, and frequently anticipating the molders' needs, W-S has developed machinery ranging from one to 300 ounces capacity, and including complete installations for every material and method commercially employed in molding by compression, transfer, and injection techniques.

This kind of close association with the beginning, development, and assured *future* of the industry makes W-S more than ever your logical first-choice consultant on your present expansion or new-plant planning.

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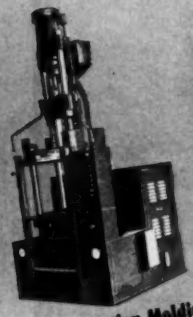
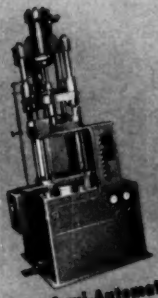
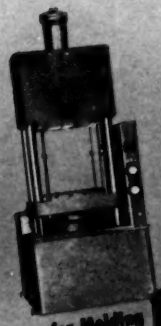
PLASTICS MOLDING...



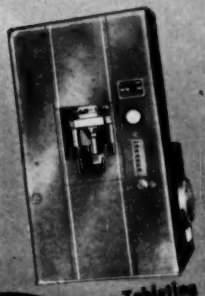
Vertical Injection Molding Machines 1, 2, 4 and 6 oz.



2 oz. Semi-Automatic Injection Molding Machine.



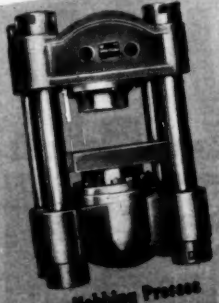
Transfer Molding Machines 30 to 1200 Tons.



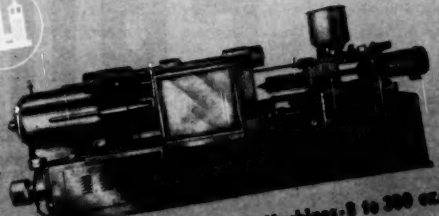
Preform Tableting Machines 10 and 100 Tons.

W-S 300 oz.
Injection Molding Machine
Die space 48" x 72" — Clamp 1500 Tons

Compression Molding Presses-50 to 1200 Tons.



Hobbing Presses 200 to 3000 Tons.



Horizontal Injection Molding Machines-8 to 300 oz.

Plastics for INDUSTRY

Pictured above is the lucite nameplate, manufactured by Cruver for the Westinghouse Unitaire air conditioning unit. Actual size is 10-1/4 inches long by 2-3/4 inches wide; decorated by the Cruver Bas-Releef process in bright silver and black.

CRUVER

MANUFACTURING CO.

2460 W. JACKSON BLVD., CHICAGO 12, ILL.

BRANCH OFFICES

DETROIT MINNEAPOLIS NEW YORK

CLEVELAND ST. LOUIS

How to manage moods—electrically

The parts enlarged in the illustration above are a drive gear, a shaft, and panels used in the many types of Superior Electric Company *Powerstats*.

These parts have one characteristic in common. They are all made from Synthane, a laminated plastic.

Superior selected Synthane for its *combination* of properties. Synthane is dielectrically and mechanically strong, easy to machine, and is attractive in appearance. The panels are easily printed at a saving over engraving cost; the gear is silent.

A *Powerstat* is a manager of moods. Installed in the lighting systems of theatres, salons, banks, and other places of business and recreation, a *Powerstat* controls the intensity and blending of light to help create any mood from the spectacular to the subdued, from reverence to revelry.

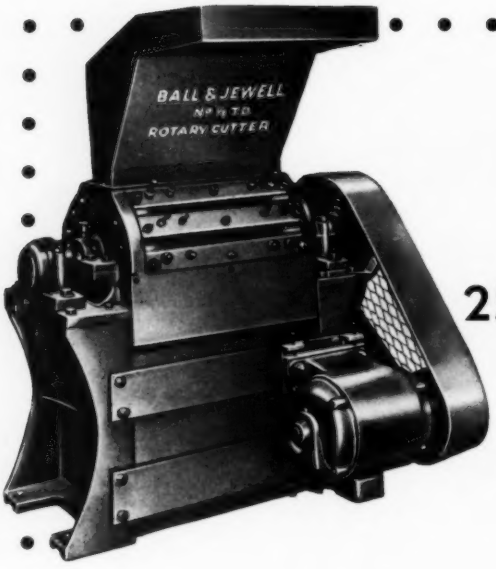
Synthane is made in many grades, each particularly desirable for some electrical, chemical or mechanical purpose. Yet each grade possesses a *combination* of other valuable characteristics. Light weight, mechanical strength, resistance to moisture, corrosion and abrasion, high dielectric strength, low power factor, dimensional stability under a variety of conditions, and ease of fabrication are just a few of them.

Should these properties of Synthane suggest a possible application to you, write for more information. Synthane Corporation, 8 River Road, Oaks, Pennsylvania.

PLASTICS WHERE PLASTICS BELONG

SYNTHANE

Manufacturers of laminated plastics



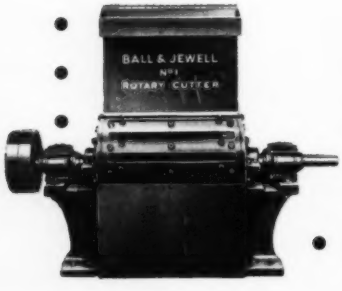
B&J CUTTERS

with 250 to 1200 lbs. per hr. grinding capacity!

The No. ½ T.D. handles sizable volume of scrap, as much as 500 lbs. of styrene per hour, yet requires minimum floor space. Available with 5" x 20" or 8" x 20" throat to eliminate clogged hoppers.

Heavy Duty Ideal . . . built for tough cutting requirements . . . reduces stock up to 1" thick at rate of approx. 250 lbs. per hr. Available with sizable 6¾" x 10" throat opening.

Up to 1,000 lbs. of molding powder per hr. can be cut on this No. 1 machine, depending on size of granulation desired.

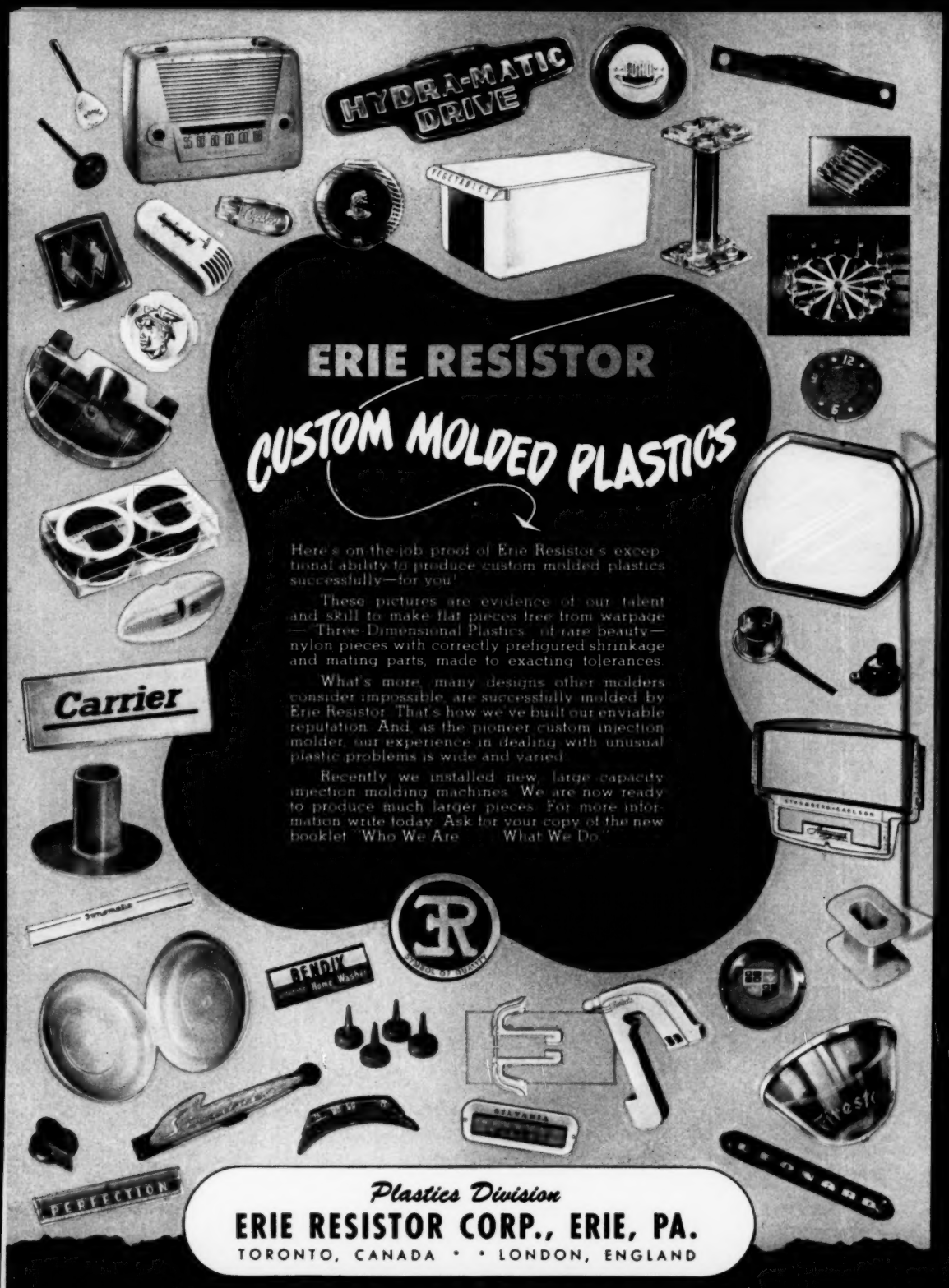


Contact Your Nearest B & J Representative

SAN FRANCISCO, CALIFORNIA; B-H-S Machinery Sales Company; LOS ANGELES, CALIFORNIA; Machinery Sales Corporation; PITTSBURGH, PENNSYLVANIA; Stanley Berg & Company; OMAHA, NEBRASKA; Fuchs Machinery & Supply Co.; CINCINNATI, OHIO; Index Machinery Corporation; SPOKANE, WASHINGTON; W. R. Matthews Machinery & Tool Supply Company; CHICAGO, ILLINOIS; Neff Kohlbusch & Bissell; MILWAUKEE, WISCONSIN; Neff Kohlbusch & Bissell; MINNEAPOLIS, MINNESOTA; Charles W. Stone Company; LEOMINSTER, MASSACHUSETTS; Standard Tool Company; DETROIT, MICHIGAN; Thoreson-McCosh, Inc.; CANADA—TORONTO & MONTREAL; Williams & Wilson Ltd., FOREIGN DISTRIBUTORS; Omni Products Corp., New York 16.

Ball & Jewell, Inc.

22-28 FRANKLIN ST., BROOKLYN 22, NEW YORK



ERIE RESISTOR

CUSTOM MOLDED PLASTICS

Here's on-the-job proof of Erie Resistor's exceptional ability to produce custom molded plastics successfully—for you!

These pictures are evidence of our talent and skill to make flat pieces free from warpage — Three-Dimensional Plastics of rare beauty — nylon pieces with correctly prefigured shrinkage and mating parts, made to exacting tolerances.

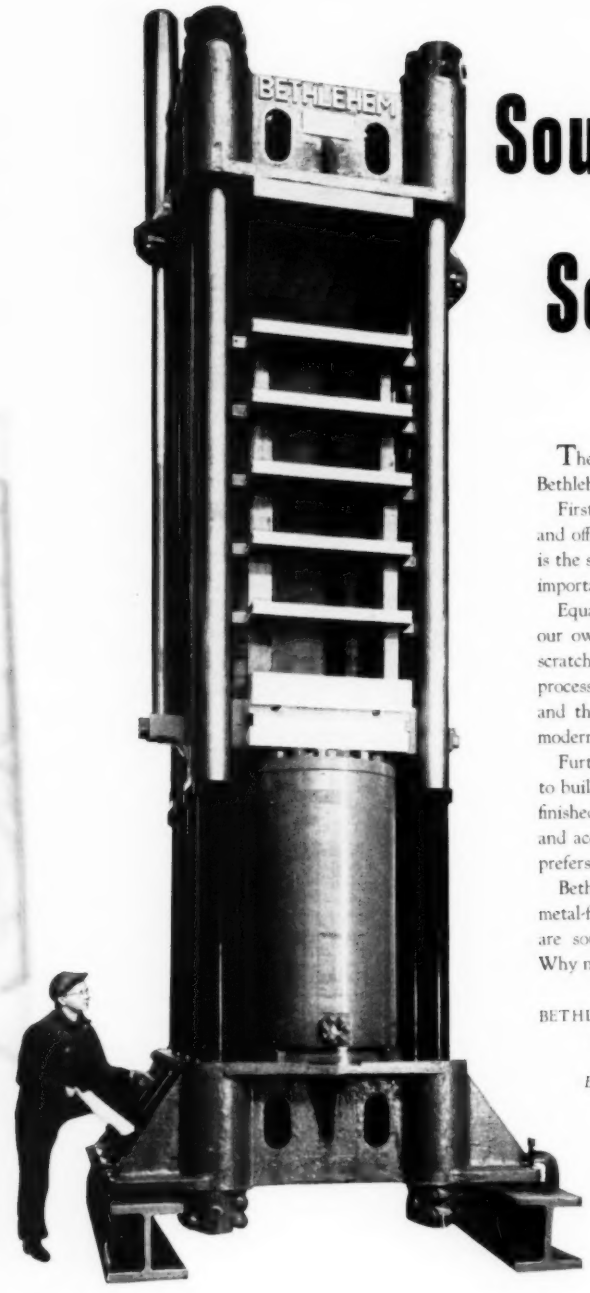
What's more, many designs other molders consider impossible, are successfully molded by Erie Resistor. That's how we've built our enviable reputation. And, as the pioneer custom injection molder, our experience in dealing with unusual plastic problems is wide and varied.

Recently we installed new, large capacity injection molding machines. We are now ready to produce much larger pieces. For more information write today. Ask for your copy of the new booklet "Who We Are — What We Do."

Plastics Division

ERIE RESISTOR CORP., ERIE, PA.

TORONTO, CANADA • • LONDON, ENGLAND



Soundly Planned Soundly Built

There are several practical reasons for selecting Bethlehem as your builder of hydraulic presses.

First of all, Bethlehem is an old hand at the business, and offers the services of specialists whose entire work is the study and design of hydraulic machinery. This is important.

Equally so is the shop set-up. At Bethlehem we make our own forgings and castings, build the press from scratch, do all the assembling, testing, etc. The whole process of manufacture is under one unified control . . . and the work is done in shops equipped with every modern facility.

Furthermore, Bethlehem is fully able—and willing—to build a press exactly as the customer wishes it. The finished machine can be supplied with full power plant and accessories, or without this equipment if the user prefers to furnish his own.

Bethlehem makes presses in hot-plate, molding, and metal-forming types and in a wide range of sizes. They are soundly planned and engineered, soundly built. Why not get in touch with us for full details?

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation
Export Distributor: Bethlehem Steel Export Corporation

BETHLEHEM STEEL

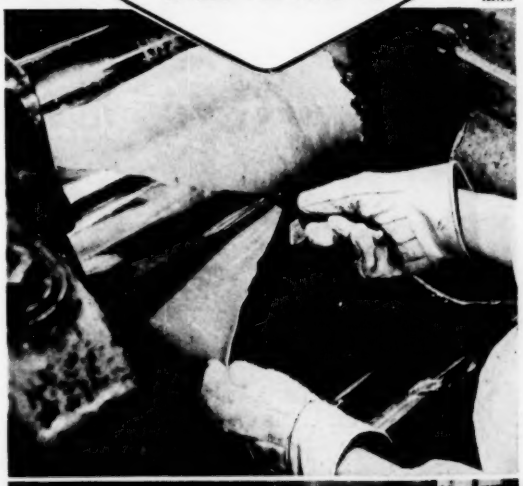
BETHLEHEM *Custom-Built* HYDRAULIC PRESSES

FOR PLASTICS . . . METAL-FORMING . . . FIBER BOARD . . . WALLBOARD . . . LINOLEUM . . . VULCANIZING

You get quality vinyls-

using 5-8% less plasticizer— when you use PLIOVIC

Laboratory-tested



You can save on those scarce plasticizers—cut costs—maintain processability—and obtain strength, toughness, flexibility and other desirable physical properties with PLIOVIC, Goodyear's vinyl chloride copolymer.

Because of the more efficient internal plasticizing action exhibited by PLIOVIC, you need from 5% to 8% less plasticizer than with comparable copolymers. Lower fusing temperature makes PLIOVIC unusually processable—on mill, Banbury, calender or in extruders.

Available in Three Types

You can get PLIOVIC in three different types:

PLIOVIC A —a general-purpose, high-molecular-weight, high vinyl chloride content resin

PLIOVIC AR —identical with PLIOVIC A, but with a reduced bulking value, making for easier handling and storage

PLIOVIC AO —gives organosols of high strength, excellent clarity and lower-heat-sealing or fusing requirements

Production-proved

USE PROVED *Products*

These laboratory-tested and production-proved copolymers are currently in short supply, but you can get sample for your evaluation by writing:

Goodyear, Chemical Division, Akron 16, Ohio

GOODYEAR

Pliovic—T. M. The Goodyear Tire & Rubber Company, Akron, Ohio

For custom

when Ability to Produce

and Know-How are Vital

Ideal is the Logical Choice

Now THAT IDEAL PLASTICS has entered the custom injection molding field, you and other users of thermoplastic moldings have a gigantic organization at your service . . . one which will produce your moldings when you need them, in the quantities you need, and at prices which reflect the genuine economy of operation that only the world's largest injection molding organization can achieve.

No other injection molder can equal the thoroughgoing service Ideal is prepared to give you. Our moldmaking, molding, assembly, inspection and shipping facilities are second to none.

moldmaking — 25 full-time engineers and a toolroom staff of one hundred tool and die makers and apprentices

molding — over one hundred modern precision injection presses of all sizes from three to three hundred ounces

assembly — all the necessary equipment including spray guns and booths, rubber presses, jigs, heat sealing machines, etc.

inspection — a large part of our 3,000 labor force is constantly devoted to checking production quality

shipping — automatic case sealers, extensive loading platforms, a large railroad siding and accessibility to main truck arteries

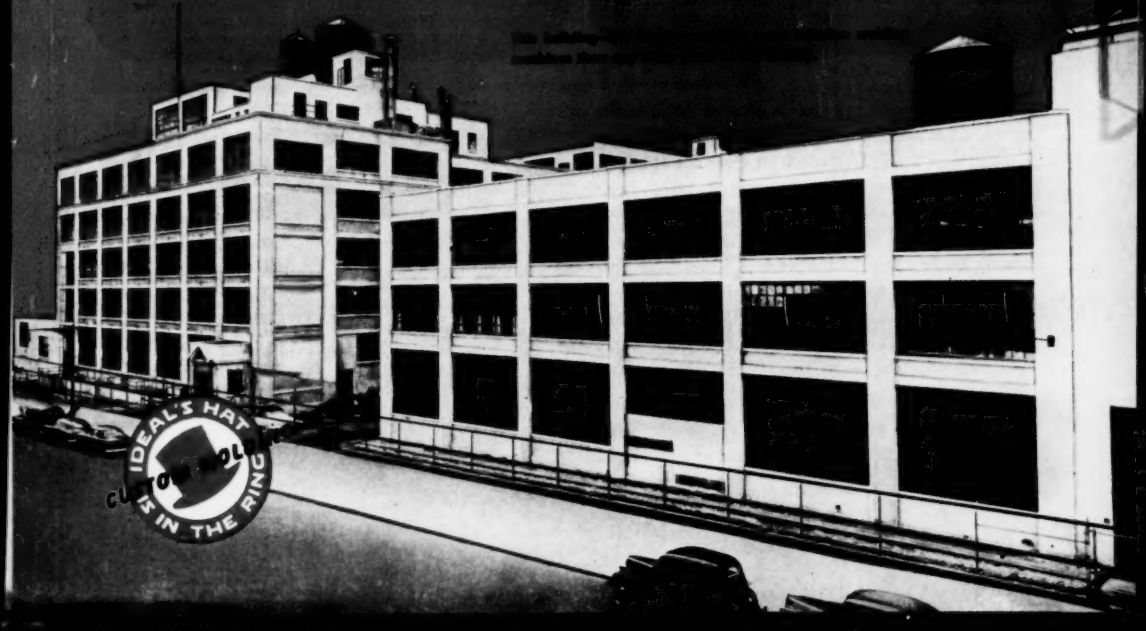
injection molding

No wonder prospective users of custom molding machine time shake their heads in amazement when they see Ideal's unmatched facilities . . . there's never been an injection molding plant that could rival Ideal's, either in quantity, quality or variety of equipment under this one roof. Ideal has everything needed to produce anything that can be injection molded.

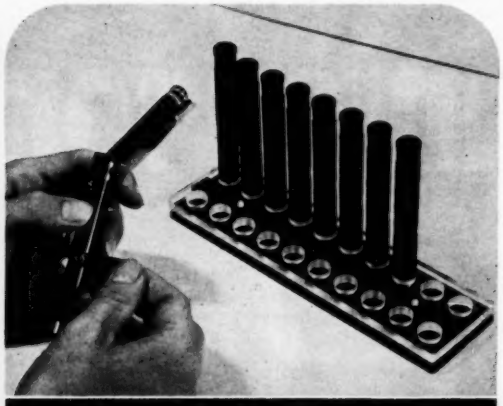
Big presses? Scores of them . . . a dozen of more than 60 ounce capacity. Mold building? More precision steel working equipment than many large machine shops can boast of. Experience? In excess of fifteen years of injection molding [illegible] plus a vitally important [illegible]

In [illegible] stockholders and [illegible] by Ideal's [illegible] factories. All [illegible] injection molding [illegible] Ideal. A letter or phone call to either office will bring a [illegible] Injection Plastics Corporation, [illegible] Hollis 7, New York. Phone: Allen [illegible] Midwest Representative, Scott Mill [illegible] 176 West Adams Street, Chicago 3, Illinois. Phone: Central 6-5336.

Better Molded Plastics **Ideal** *for Industry & Home*

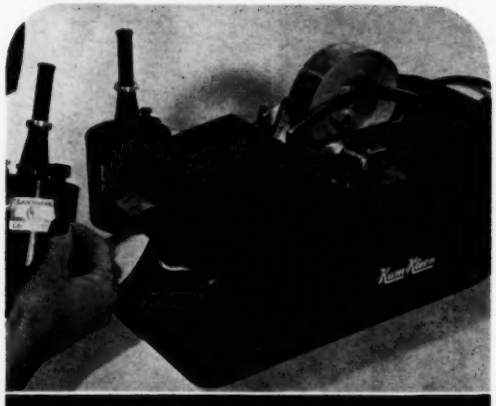


informative labeling in action!



Information that might mean life or death for atomic workers must stick-and-stay-stuck even to small curved plastic surfaces.

Kum-Kleen pressure-sensitive labels were chosen because of their stickability, ease of application, and low on-the-product cost.



Kum-Kleen labels combined with the new Avery Electric Dispenser are applied at production-line speed—free of expensive equipment costs.

HERE IS AN EXCELLENT EXAMPLE OF INFORMATIVE LABELING IN ACTION, from Landsverk Electrometer Company of Los Angeles. Their Analysis Unit gives scientists and atomic workers accurate readings of the body absorption of deadly radio activity. Because important information must be carried on to the user and remain firmly affixed to the product, Kum-Kleen pressure-sensitive labels were selected. Kum-Kleen labels can be trusted to stick-and-stay-stuck to all types of plastics, even the most difficult-to-label surfaces, to never pop or curl off even when subjected to temperature extremes.

Landsverk is just one of the many, many manufacturers using Kum-Kleen pressure-sensitive Informative Labeling for its positive adhesive qualities, ease of application, and low on-the-product's cost.

Write for samples and prices

Kum-Kleen

AVERY ADHESIVE LABEL CORPORATION

NEW YORK CITY: 41 Park Row
DETROIT: 3049 East Grand Boulevard
CLEVELAND: 2123 East 9th Street
PHILADELPHIA: Commercial Trust Building
CHICAGO: 608 South Dearborn Street
CINCINNATI: 626 Broadway Street
MONROVIA, California

Representatives In All Principal Cities

ZENITH PLASTICS

in association

The BRUNSWICK-BALKE-

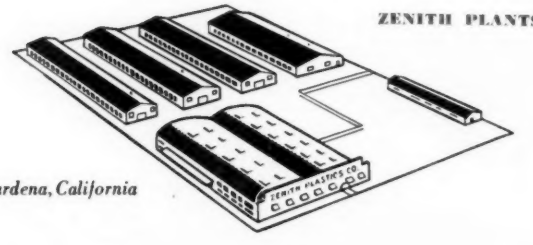
Announces

added facilities for the

AIRCRAFT and other American

Industries in the East,

Mid-West, South and West



Gardena, California

COMPANY

with

COLLENDER COMPANY

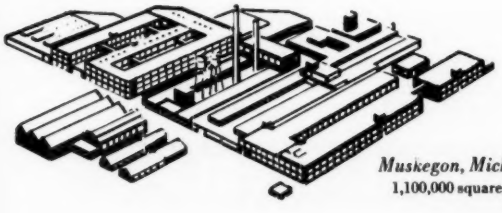
In order to speed up and facilitate the production of many urgently needed essentials in the national defense, as well as to contribute their joint efficiency to American industry, the ZENITH plants on the West Coast and the BRUNSWICK Midwestern and Southern facilities are now in a position to cooperate in reinforced plastics production.

This development adds the broad manufacturing facilities and large pool of skilled manpower of a long-established and internationally recognized firm, to the specialized experience and technical skill of ZENITH in the fabrication of reinforced Fiberglas* parts by low-pressure lamination and pre-forming. Address inquiries about your requirements to:

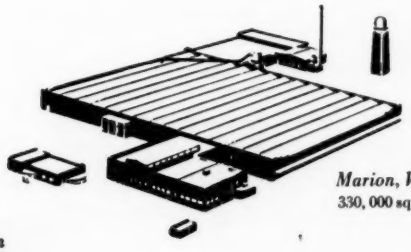
ZENITH PLASTICS CO. • ***Gardena, California***

The BRUNSWICK-BALKE-COLLENDER CO. • ***623 S. Wabash Ave., Chicago 5, Ill.***

BRUNSWICK PLANTS



Muskegon, Michigan
1,100,000 square feet



Marion, Virginia
330, 000 square feet

no more GAMBLING on tool steel selection"

[⅓ actual size; Selector is in 3 colors]

Since the first announcement, hundreds of tool steel users have received their CRUCIBLE TOOL STEEL SELECTORS. The comments received indicate that this handy method of *picking the right tool steel right from the start* is going over big.

"Handiest selector I've ever seen"

"No more gambling on tool steel selection"

"You're right, the application should dictate the choice of the tool steel" . . . and many, many more favorable comments.

You'll want your CRUCIBLE TOOL STEEL SELECTOR. It uses the only logical method of tool steel selection—begin with the application to pick the right steel! And the answer you get with one turn of the Selector dial will prove satisfactory in every case, for the CRUCIBLE TOOL STEEL SELECTOR covers 22 tool steels which fit 98% of all Tool Steel applications. ALL the tool steels on the Selector are in Warehouse Stock . . . that means when you get the answer, you can get the steel . . . fast!

Write for your Selector today! We want you to have it, because we know you've never seen anything that approaches your tool steel problems so simply and logically. Just fill out the coupon and mail. Act now! CRUCIBLE STEEL COMPANY OF AMERICA, Chrysler Building, New York 17, N. Y.

Here's how it works:

To use the Selector, all you need know is the characteristics that come with the job: type and condition of material to be worked, the number of pieces to be produced, the method of working, and the condition of the equipment to be used.

FOUR STEPS—and you've got the right answer!

1. Move arrow to major class covering application
2. Select sub-group which best fits application
3. Note major tool characteristics (under arrow) and other characteristics in cut-outs for each grade in sub-group
4. Select tool steel indicated

That's all there is to it!

Here's an example:

Application—Deep drawing die for steel

Major Class—Metal Forming—Cold

Sub-Group—Special Purpose

Tool Characteristics—Wear Resistance

Tool Steel—Airdi 150

One turn of the dial does it!

And you're sure you're right!!

Crucible Steel Company of America
Dept. MO, Chrysler Building
New York 17, N. Y.

Gentlemen:

Sure! I want my CRUCIBLE TOOL STEEL SELECTOR!

Name _____ Title _____

Company _____

Street _____

City _____ State _____

CRUCIBLE first name in special purpose steels

TOOL STEELS

fifty-one years of Fine *steelmaking*

Branch Offices and Warehouses: ATLANTA • BALTIMORE • BOSTON • BUFFALO • CHARLOTTE • CHICAGO • CINCINNATI • CLEVELAND • DENVER • DETROIT HOUSTON, TEXAS • INDIANAPOLIS • LOS ANGELES • MILWAUKEE • NEWARK • NEW HAVEN • NEW YORK • PHILADELPHIA • PITTSBURGH • PROVIDENCE ROCKFORD • SAN FRANCISCO • SEATTLE • SPRINGFIELD, MASS. • ST. LOUIS • SYRACUSE • TORONTO, ONT. • WASHINGTON, D. C.

Ortho-nitrobiphenyl, low-priced plasticizer that's efficient... and available

If costs and availability of plasticizers are headaches in your business, we suggest you investigate Monsanto's ortho-nitrobiphenyl today. ONB is efficient as a primary plasticizer or as an extender and it is immediately available in any quantities you need. It sells for only 14½ cents a pound in truckloads or carlots.

Ortho-nitrobiphenyl (also known as ortho-nitrodiphenyl) is compatible with cellulose esters and ethers, polyvinyl chloride, polyvinyl butyral, polyvinyl acetate, styrene, rosin and rosin esters, modified phenolic resins, oil-soluble alkyd resins and vegetable oils. This wide compatibility, plus its low hydrolysis rate and low price, makes ONB an unusually attractive plasticizer.

Most resins, both natural and synthetic, can be plasticized with ONB. The amount of required plasticizer varies with the resins and the use of the finished product. The volatility of ortho-nitrobiphenyl is less than diethyl phthalate and greater than dibutyl phthalate.

Ortho-nitrobiphenyl is readily soluble in carbon tetrachloride, mineral spirits, pine oil, turpentine, benzene, acetone, glacial acetic acid and perchlorethylene. It is a good solvent.

For technical information on ortho-nitrobiphenyl, contact the nearest Monsanto Sales Office or write for a copy of Monsanto Technical Bulletin No. OD-102. MONSANTO CHEMICAL CO., Organic Chemicals Division, 1700 South Second Street, St. Louis 4, Missouri.

DISTRICT SALES OFFICES: Birmingham, Boston, Charlotte, Chicago, Cincinnati, Cleveland, Detroit, Houston, Los Angeles, New York, Philadelphia, Portland, Ore., San Francisco, Seattle. In Canada, Monsanto (Canada) Ltd., Montreal.

MONSANTO
CHEMICALS – PLASTICS

SERVING INDUSTRY . . . WHICH SERVES MANKIND

YOUR PROCUREMENT JOB

IS SIMPLIFIED BECAUSE—

All these P-K Screws are Standard

With screws in limited supply, you have a better chance of improved delivery when you order *standard* types and sizes than when you order specials.

For this reason, the *complete* line of Parker-Kalon Self-tapping Screws is a definite advantage. In changing to a standard screw, you are not restricted to one or two types only remotely suited to your assembly needs. In the P-K* line, you have a choice of 5 distinct standard types, each designed for a special purpose. Chances are your assembly can be adapted to some one of these types with a minimum of redesign.

P-K Assembly Engineers will help you in every way possible to adjust your assemblies to limited supplies, and apply the long experience of Parker-Kalon to your most difficult problems of planning and procurement. Parker-Kalon Corporation, 200 Varick Street, New York 14, N. Y. Sold through Accredited Distributors.

TYPE A— the original Sheet Metal Screw, for light gauge sheet metal. **TYPE Z**— a thread-forming screw for light and heavy gauge sheet metal, non-ferrous castings, plastics, etc. Also made with **HEX HEAD**, suitable in heavier sizes for structural steel. **TYPE F**— cuts standard machine screw thread as it is driven. For ferrous and non-ferrous castings, light and heavy sheet metal, plastics, etc. **TYPE U**— Drive Screw for making permanent fastenings to ferrous and non-ferrous castings, plastics, etc.

*TRADE MARKS REG. U.S. PAT. OFF.

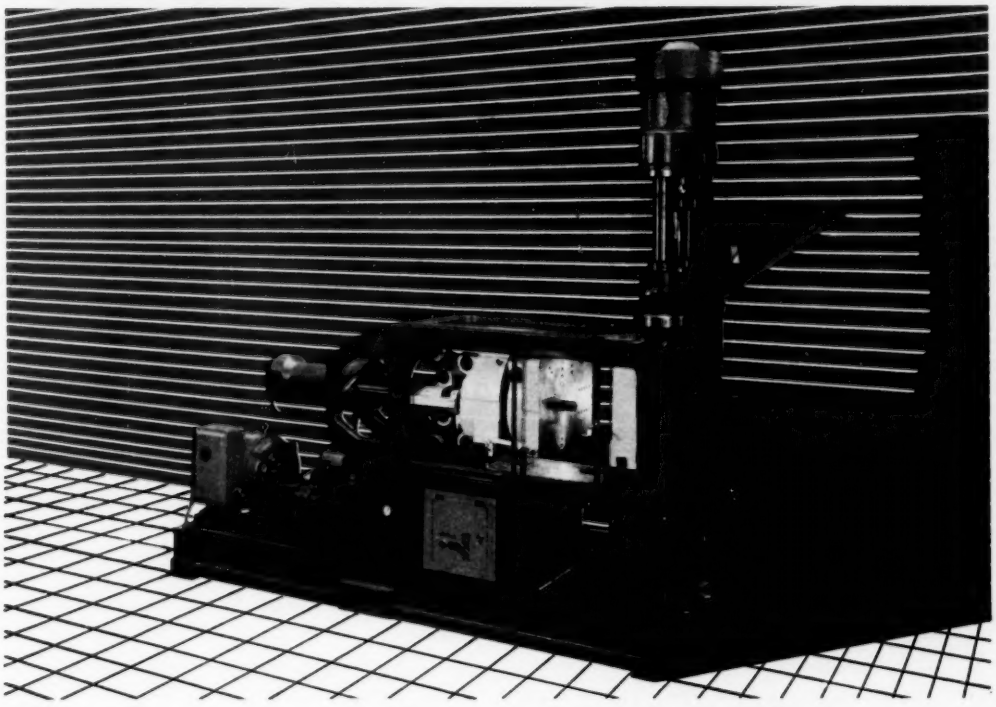
IF IT'S P-K IT'S O.K.

The Original

PARKER-KALON* SELF-TAPPING SCREWS

A TYPE AND SIZE FOR EVERY METAL AND PLASTIC ASSEMBLY

THE NEW 8 OUNCE LESTER



The 8 ounce machine with the **BIG** *features*

The backbone of the injection molding industry is the 8 ounce machine. We've taken the top performer in that class—the old 8 ounce Lester—AND MADE IT BETTER! All the highly valued features of the old 8 have been retained: you get the same high locking tonnage, large die platens, one-piece cast steel frame and central die adjustment. Besides that, you get these new features: HIGH SPEED, DOUBLE TOGGLE LINKAGE • 20% MORE PLASTICIZING CAPACITY • LATEST AND MOST EFFICIENT INJECTION CYLINDER DESIGN • NARROW BAND HEATERS • 4-ZONE HEATER CONTROL • EASY MAINTENANCE THROUGH EXPOSED HYDRAULICS • Check the other features of the new L-2-8 by writing for complete specifications. The new L-2-8 combines the high speed of a small machine with the locking, rigidity and strength of a large machine to give you the competitive advantage you are seeking.

LESTER *INJECTION MOLDING MACHINES*

distributed by LESTER-PHOENIX, INC., 2621 CHURCH AVENUE • CLEVELAND 13, OHIO

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Detroit . . . . . Thoreson-McCosh
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Cleveland . . . . . Don Williams
Cincinnati . . . Index Machinery Corp.
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San Francisco . . . . . J. Fraser Rae
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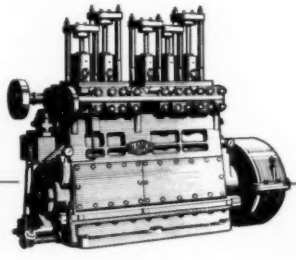
Calcutta, India . . Francis Klein & Co., Ltd.
Sydney, Australia . . Scott & Holladay, Ltd.
Japan, New York . . W. M. Hewitt, Inc.

It's the short way home . . . when the high road means a straight line and a through-flow of traffic. It means too that you can get more work done today . . . and still more tomorrow.

Designed to give virtually the same results, the Aldrich Direct Flow Pump passes liquid *directly* through the working barrel. Aldrich design engineers have successfully eliminated two right angle turns in the fluid-end block.

This design, resulting in a reduction of "loss space", means more work done at less cost. Volumetric efficiency is improved and materials are saved. In each size, you get a smaller pump that does the same work better . . . which is why more people are coming to Aldrich for pumps made in 3", 5", 6" triplex; 5", 6" quintuplex and 5", 6" septuplex units . . . to meet medium-to-high pressure and capacity requirements.

Applications include: molding, extruding and other operations requiring hydraulic pressure . . . Aldrich designs and furnishes *complete* central hydraulic systems—incorporating Aldrich Pumps, accumulators, alleviators and control systems. Write for Data Sheets.



THE ALDRICH PUMP COMPANY

6 GORDON STREET • ALLENTOWN, PENNSYLVANIA

...Originators of the Direct Flow Pump

Representatives: Birmingham • Bolivar, N. Y. • Boston • Buffalo • Chicago • Cincinnati • Cleveland • Denver • Detroit
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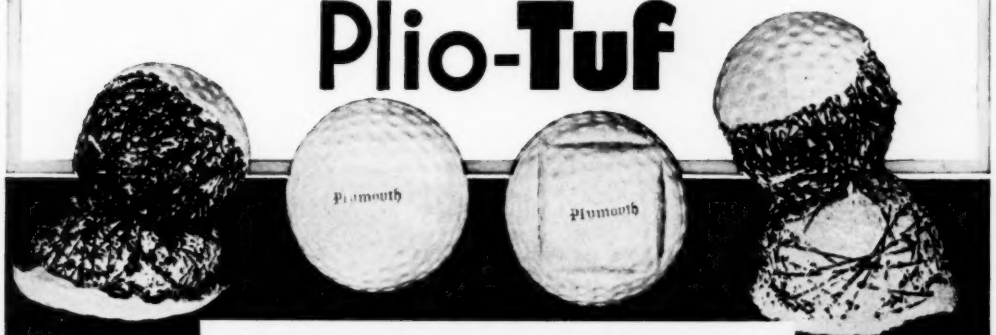
Richmond, Va. • St. Louis • San Francisco • Seattle • Spokane, Wash. • Syracuse • Tulsa • Export Dept.: 751 Drexel Building, Phila. 6, Pa.

higher product quality—but saves thousands of dollars

by using golf ball covers made of

Plio-Tuf



BETTER ADHESION, GREATER CUT RESISTANCE of golf ball covers made with PLIO-TUF (left, two samples) are shown by strip test and "Guillotine" test. Compare with the right two samples, showing balls made with ordinary natural resin. Photo courtesy Plymouth Golf Ball Company.

USE PROVED *Products*

BY using PLIO-TUF for his golf ball covers, this manufacturer has saved literally thousands of dollars each year over the cost of his previous compounds—made with a natural resin. Yet using Goodyear's synthetic copolymer resin, PLIOLITE S-6B, and rubber in a PLIO-TUF compound has meant no sacrifice of product quality.

Golf balls made with PLIO-TUF show improved resistance to cuts—better adhesion between cover and winding. And "click" is maintained, too—as audible proof of product quality.

PLIO-TUF compounds are in use in a wide range of applications where impact resistance, toughness, hardness, or rigidity are important. At present, the PLIOLITE resins used in the manufacture of PLIO-TUF are all in short supply. However, you can secure samples for laboratory evaluation, together with full information, so write today—and plan for future use.

Goodyear, Chemical Division
Akron 16, Ohio

DON'T FORGET to attend the World Chemical Conclave and Diamond Jubilee Meeting of the American Chemical Society—September third to seventh.

GOODYEAR

Plio-Tuf, Pliolite—T. M.'s The Goodyear Tire & Rubber Company, Akron, Ohio

BY THE BOATLOAD

TODAY many of the biggest names in the aviation, automotive appliance, electrical and electronics fields are Continental customers.

Whether they need refrigerator components, a radio cabinet, aircraft laminate or a magneto housing these big companies have learned that Continental service pays off in the fast delivery of precision-made parts.

Continental has the last word in efficient plastic molding and laminating machinery. Our people have the skill that only long experience in plastics production can provide. Finally, the big Continental plastics plant is strategically located for speedy deliveries to any point in the U. S.

From plans to plastics—Continental service is tops.

MODERN PLANT. Continental has complete facilities for designing, producing and finishing plastic parts. Batteries of precision machines turn out moldings and laminates in mass-production quantities.

Plastics Division CAMBRIDGE, OHIO

100 East 42nd Street, New York 17, N. Y.
1721 NBC Building, Cleveland 14, Ohio
Hillcrest - Route 2, Knightstown, Ind.
New Center Building, Detroit 2, Mich.
135 S. LaSalle Street, Chicago 3, Illinois

Here's a partial listing of the equipment available for producing your components:

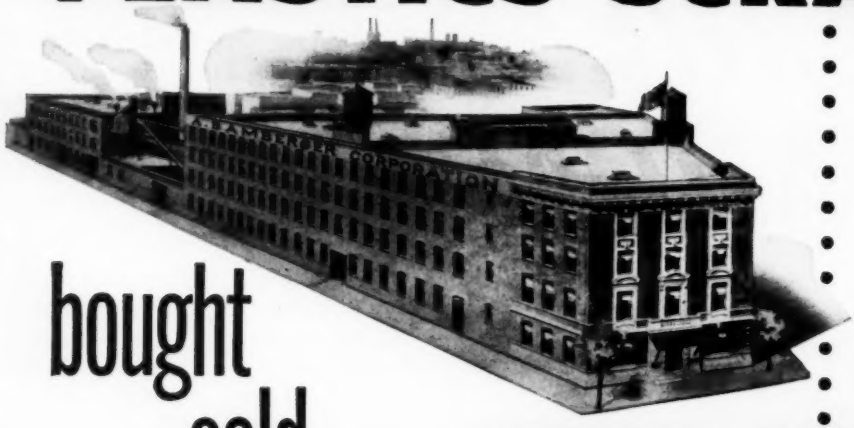
58 presses for Compression, Transfer and Plunger Molding — 50- to 750-ton capacity

19 injection molding machines — 2- to 80-ounce capactiy

Continuous Laminator — Largest of its type

Reinforced Low-Pressure Molding Facilities

PLASTICS SCRAP



bought sold reworked

We offer
the World's finest facilities for:
RECLAIMING • REPROCESSING
RECOMPOUNDING • RECOLORING

We reprocess *Your* Plastics Scrap, By-Products, Surplus for *Your* own Re-Use.
We have complete laboratory facilities for Testing, Analyzing, and Pilot Running of Customer's Materials.

GRANULATING • PELLETIZING
CHEMICAL FLOTATION • WASHING • CLEANING • DRYING
SEPARATION OF CONTAMINATED MATERIALS
REMOVAL OF FOREIGN MATTER
COMPOUNDING • MIXING • COLORING • EXTRUSION

UNLIMITED KILN DRYING FACILITIES

OUR SERVICE

As the world's leading Plastics Scrap Reclaimers we offer the almost unlimited facilities of our vast plant to industry in these days of shortages in all basic raw-materials.

We have available over 150,000 sq. ft. of floor space devoted exclusively to the processing of plastics — virgin and scrap — resinous materials or by-products.

We specialize in the reduction to small particles — to your most exacting specifications — of all lumps, blocks, mill ends, bleeder waste — regardless of size and whether rigid or soft.

We also custom-compound *all* thermoplastics to your specifications.

A. BAMBERGER

CORPORATION
PLASTICS MATERIALS
703 Bedford Avenue, Brooklyn 6, N. Y.
Phone: MAin 5-7150
CABLE: CHEMPROD BROOKLYN

Buddy Boy Popcorn Dispenser, molded for Buddy Boy Popcorn Co., Elgin, Illinois

Write on your letterhead for the new Injection Molded and Extruded Plastics Catalog. Or, for detailed information about [redacted]* *piping, tubing and fittings, write for circulars containing data and illustrations.*
**Trademark Registered*

Skillful Molding Helps Popcorn Sales POP

Let this Buddy Boy hot Popcorn Dispenser show you how we can serve your plastic product interests best.

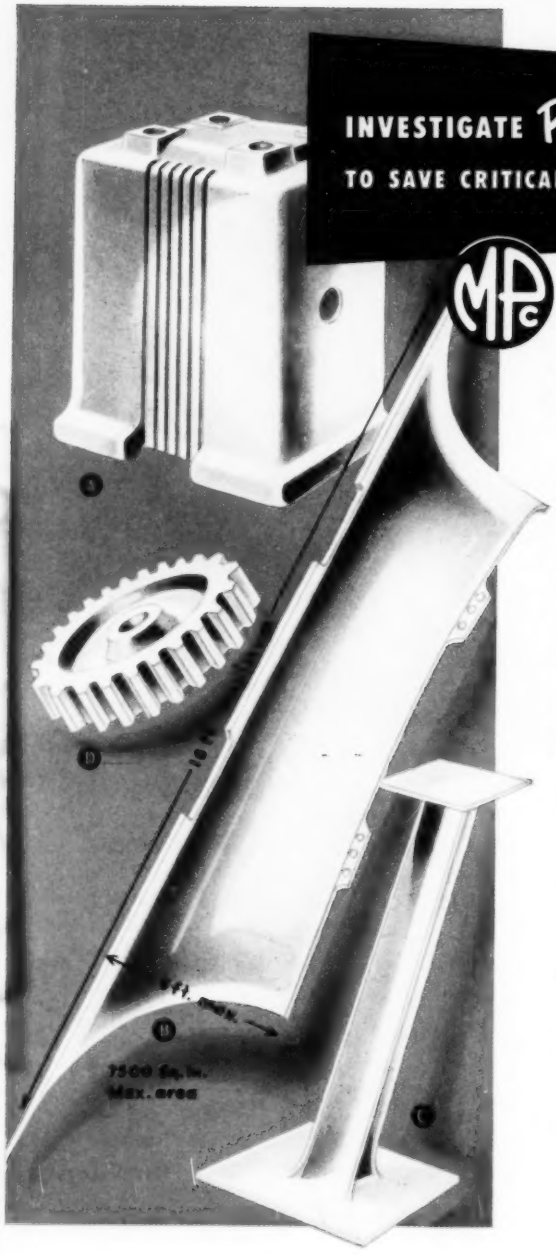
Size-wise this was a big job. In spite of its size, however, the dispenser demanded ultra fine precision in both engineering and molding. The transparent pieces, being both non-warping and unsupported, are identical and required a very close fit. The legs, made hollow and in 2 pieces, needed the same fit. Transparency, edge lighting depressed from inside, and the colorful, large one piece top provided the point-of-sale punch.

Let us take the same kind of sales-minded, sound engineering look at your plastic problems today. It's help without obligation on your part.

ELMER E. MILLS CORPORATION

INJECTION MOLDERS and EXTRUDERS of: Tenite, Lumarith, Plastacele, Fibestos, Lucite, Nylon, Plexiglas, Polystyrene, Styron, Loalin, Vinylite, Geon, Plexene, Polyethylene, Cerex, Forticel, [redacted]*, Saran, and other Thermoplastic Materials.

2930 NORTH ASHLAND AVENUE • CHICAGO 13, ILLINOIS



INVESTIGATE Plastics MOLDED BY MPc TO SAVE CRITICAL METALS FOR CRITICAL NEEDS

MPc combines unmatched molding facilities with inventive engineering skill to make plastics perform in hitherto unsuspected ways

How can *you* employ molded plastic parts? There is no existing standard by which to judge. Yesterday's limitations on the use of plastics no longer exist. Amazing new molding materials and reinforcing materials are now available. New molding techniques developed at **MPc** utilize these materials for the production of molded plastic parts with greater areas, greater weight...yes, and far greater strength. Here at **MPc**, the challenge of the new or unusual is met with a spirit of enterprise...supported by unique molding and tool-room facilities. Submit your plastics molding problem to MOLDED PRODUCTS CORPORATION, 4535 W. Harrison St., Chicago 24, Illinois.

A. HOUSINGS...
Complicated shapes produced in a single molding operation. Plastics adds color... sleek lines...mold-perfect finish.

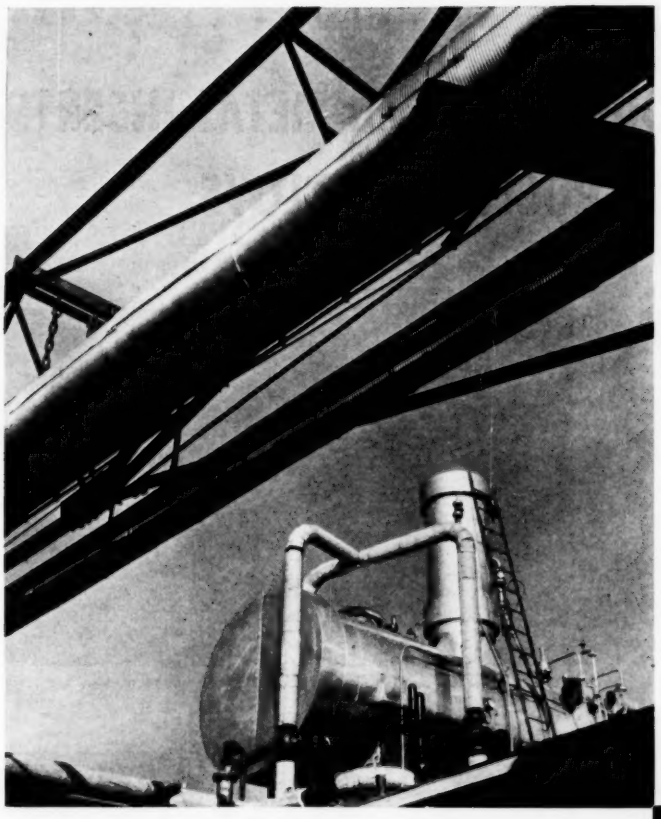
B. SHAPED PANELS...
Molded complete with assembly holes or studs. No fabricating cost, no finishing cost.

C. STRUCTURAL MEMBERS...
Combine light weight with high shock and sheer strength.

D. WHEELS, PULLEYS, GEARS...
Noiseless...high impact strength...immune to acids, oils and moisture.

PLASTICS DIVISION
MOLDED PRODUCTS CORPORATION
..Pace-Makers in Plastics Molding

FREE "Data Book of **MPc** Facilities," an engineering-eye view of **MPc** press capacities and other production facilities...together with a survey of **MPc** special skills available for your use. *Write for your copy.*



Erinoid

POLYSTYRENE

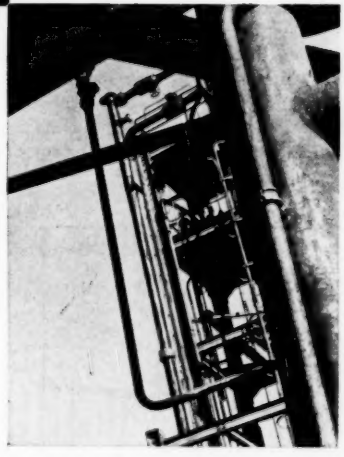
—A 'PLUS' YEAR FOR BRITISH PLASTICS!

'Festival Year' means a great deal for British injection moulders, for ERINOID polystyrene is now on the market.

ERINOID polystyrene is manufactured in the new sealed, air-conditioned plant* of Styrene Products Ltd., a company formed jointly by Petrochemicals Ltd. and Erinoid Ltd. These two British firms possess unique experience in the fields of petroleum-chemicals and plastics manufacture; their pooled resources are an invaluable asset to the European plastics industry.

ERINOID polystyrene is available in a wide range of colours, in the form of moulding powder, sheeting and rod.

**Designed and constructed by Petrocarbon Ltd*



STYRENE PRODUCTS LTD

96 PICCADILLY · LONDON · W1 · ENGLAND

Marketing Agents:

ERINOID LTD · STROUD · GLOUCESTERSHIRE · ENGLAND

for many applications

YOU DON'T NEED METAL INSERTS

with ROGERS FIBERLOYS CORPORATION

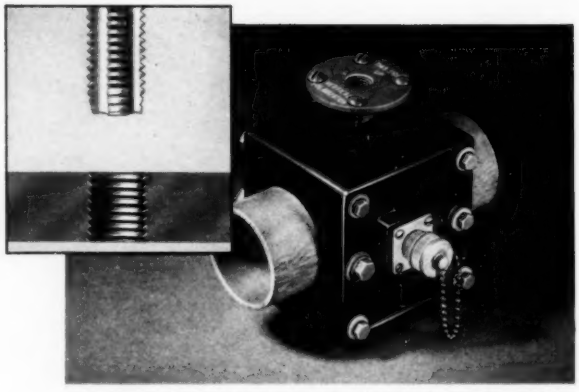
Tap Rogers Phenolic Fiberloys at High Production Speeds and Get Clean, Strong Threads.

Or Use Self-Tapping Screws and Be Sure Of a Firm, Non-Cracking Grip.

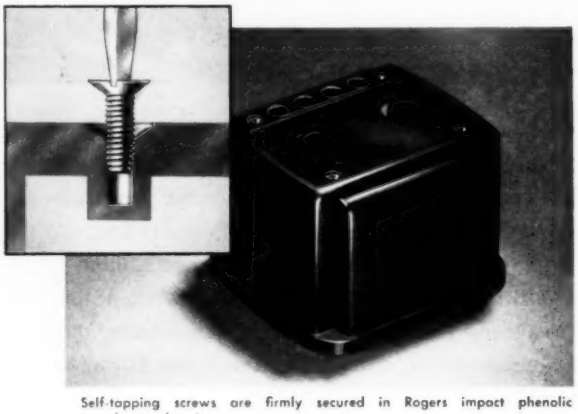
You can eliminate metal inserts in many of your molded parts by using Rogers impact phenolics. You'll save money, speed up your molding operations, and reduce some supply headaches.

Rogers materials can be used in two ways: as diecut inserts in place of metal; with general purpose phenolics, or for the complete part if high overall strength is required.

Various grades of Rogers impact phenolics are available to meet specific requirements. If you have special problems, Rogers can develop a made-to-order material. We specialize in special formulations.



Antenna mast of Rogers impact phenolic tapped at high speed for machine screws.



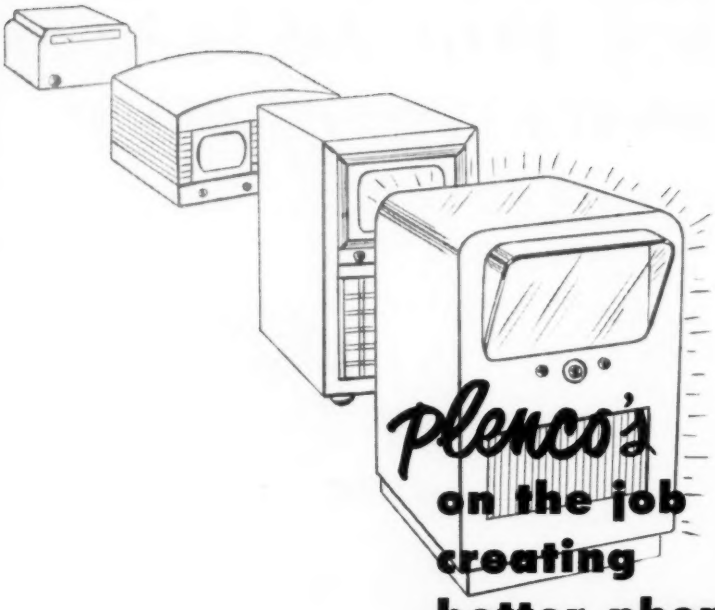
Self-tapping screws are firmly secured in Rogers impact phenolic transformer housing.

ROGERS
CORPORATION
Established in 1832

ADDED FACTS ABOUT ROGERS IMPACT PHENOLICS CORPORATION

FAST CURING	Impact strength is combined with flexural strength.
EASY TO MOLD	Bulk compounds can be automatically preformed.
LOW BULK FACTOR	Sheet compounds can be diecut into preform blanks for molding.

EASY-READING BOOKLET Please write for "Here's Rogers and Its Fiberloys." Dept. P, Rogers Corporation, Manchester, Conn.



Plenco's on the job creating better phenolics

Phenolic materials that were entirely satisfactory as little as a year or two ago, have, in many cases, been outdated by advancing production requirements. There's a demand for fast curing materials for faster cycles. Castings of previously unheard of size are being designed and molded. Deep draw pieces such as television console cabinets call for extremely long flow formulations.

Where does Plenco fit into this picture? By maintaining a policy of keeping *ahead* of requirements, by creating improved phenolic materials *before* they are needed, Plenco is helping to open the way for better plastic products at lower cost. Constant research by Plenco engineers is a safeguard customers can count on.

Antcipation of your requirements guarantees that Plenco will be ready with the right phenolic, when you call for it.

You may not need an out-of-the-ordinary material for some time to come. But it should be reassuring to know you can count on Plenco when the day does arrive. Of course, the core of Plenco's business is manufacturing and supplying the more usual phenolics. Our standard grades are accepted and used by many leading molders. They too are protected by the constant vigilance of Plenco research.

PLENCO PHENOLICS

. . . black, browns, mottles and colors in General Purpose, Heat Resisting and Medium Impact grades. Special Purpose Molding Compounds and Resins are produced to fulfill special molding requirements.

PLASTICS ENGINEERING CO.
Sheboygan, Wisconsin

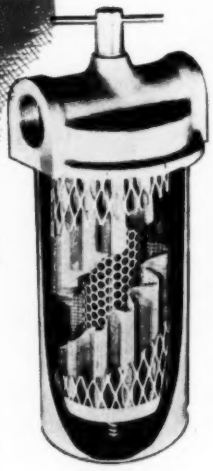
Simplify Your Preventive Maintenance

Sump Type
(Cutaway)

with

MARVEL SYNCLINAL FILTERS

For All Hydraulic Systems



Line Type
(Cutaway)

SIMPLE EFFICIENT DESIGN REDUCES DEMAND ON YOUR SKILLED MAINTENANCE HELP

ANY WORKMAN can disassemble, clean and reassemble Marvel Synclinal Filters. Cleaning is done quickly, and Marvel's extra capacity requires less frequent cleanings. This means more production per machine with less man hours. Marvel protected machines spend their time producing, not in being serviced and repaired. Marvel's simple efficiency changes down-time to producing time.

STANDARDIZE WITH MARVEL
Choice of Over 200 Original Equipment Manufacturers

Improve your all-important preventive maintenance by simplifying it. Use Marvel Synclinal Filters throughout your plant. Specify Marvel on new machines, add Marvel to present machines. No moving parts to wear, nothing to keep in stock. Your first cost is your only cost.

Available in capacities of 5 to 50 g.p.m., and in mesh sizes from 30 to 200. Multiple installation provides capacities as great as you may require. Depend on Marvel for efficient filtration of non-corrosive liquids in all hydraulic and low pressure systems.

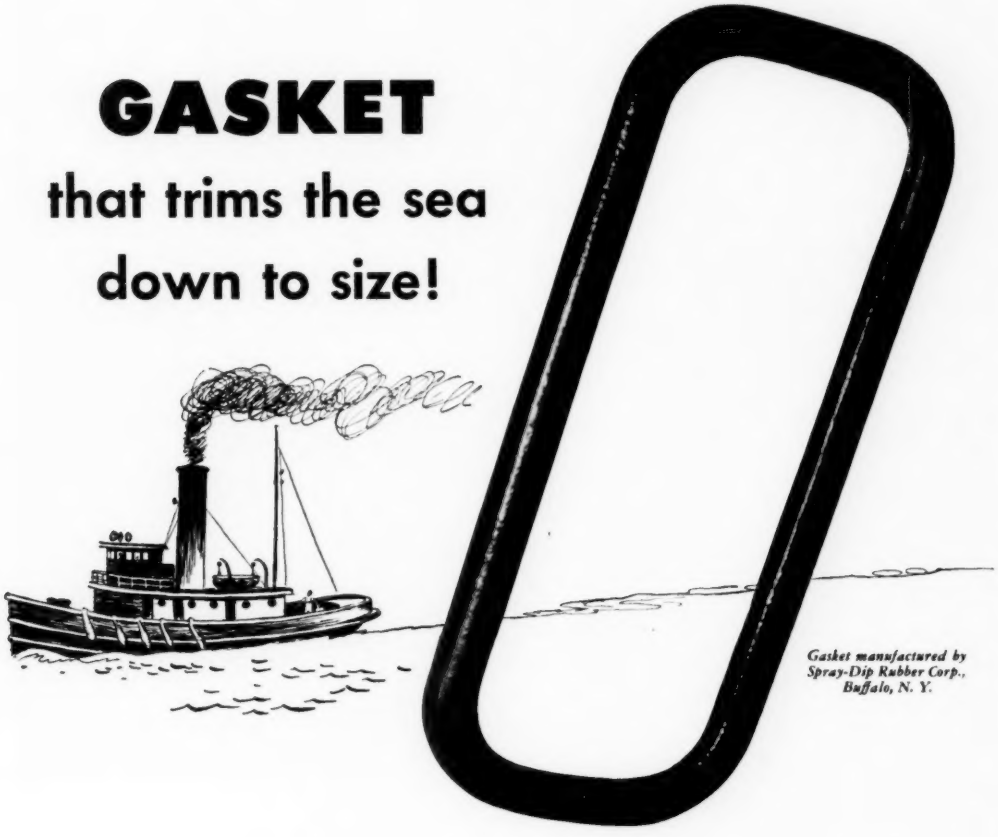
Write for folder 105

MARVEL ENGINEERING COMPANY
625 W. Jackson Blvd. Chicago 6, Ill.

Another successful development using the AMERICAN ANODE *process*

GASKET

that trims the sea down to size!



Gasket manufactured by Spray-Dip Rubber Corp., Buffalo, N. Y.

HERE'S a sea-going gasket that may stir up ideas for you—that shows you how American Anode can help you solve problems and improve products.

This gasket is a low pressure seal for hatches on low-riding vessels to make them watertight. Its unique features are the sponge rubber core, and the special-type rubber coating applied by the American Anode process.

Frequently, former hard rubber seals couldn't be confined properly when hatches were closed. The rubber would "flow". With this new gasket, the core gives, but does not flow. Hatches can be sealed tightly and securely against the sea. And the special rubber coating is extremely resistant to weather, gas, oil, many chemicals and other destructive conditions.

It's another example of the wide range of applications for American Anode materials. Decontamination boots, plastisol gloves, coated chains and more defense and civilian items are others.

Wherever special coatings or plastisols (vinyl plastic paste) can be used to improve or develop products, we can help you. We can take over the design, manufacture and delivery of the finished product. If you're interested, please write Department. AC-5, American Anode Inc., 60 Cherry Street, Akron, Ohio.

AMERICAN ANODE

CRUDE AND AMERICAN RUBBER LATICES, WATER CEMENTS AND SUSPENSIONS, AMERAN RESIN PASTES, COMPLETE MANUFACTURING FACILITIES

PORTRAIT OF A BRITISH TOOL-MAKER

Never mind the machine (for the moment). Concentrate on the man who's operating it. He's only 38, but that means twenty-four years' continuous experience in British plastics engineering. He's good.

Like him to work for *you?* The machine he's handling (a Keller die-sinking machine) is just one item in a tool-shop as modern in equipment and organisation as any in the Western World. The company he works for* banks its reputation on *accuracy and know-how.* It makes tools for every kind of plastics molding, for export to many countries throughout the world.

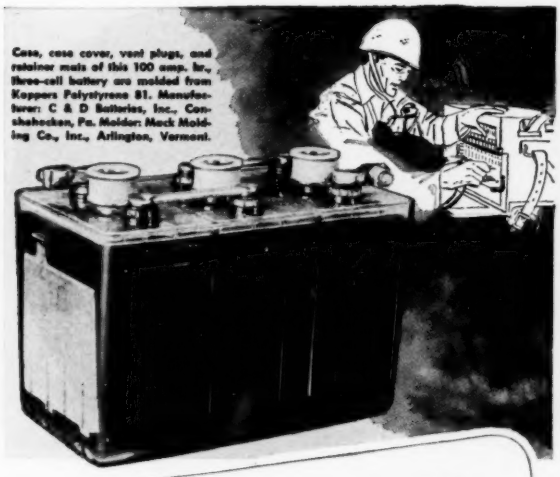
A good steel mold is a key asset in your business, standing for an important sum of money. So long as that money's well spent, a short sea journey is neither here nor there.

* B.I.P. TOOLS LIMITED

TYBURN ROAD, ERDINGTON, BIRMINGHAM 24, ENGLAND

Cables: PLASMOULD BIRMINGHAM ENGLAND

B·I·P GROUP



Case, case cover, vent plugs, and retainer mats of this 100 amp. hr., three-cell battery are molded from Koppers Polystyrene 81. Manufacturer: C & D Batteries, Inc., Conshohocken, Pa. Molder: Mack Molding Co., Inc., Arlington, Vermont.

Base of this plug-in coil is injection molded from Koppers Polystyrene 8X. Manufacturer: Bud Radio, Inc., Cleveland, Ohio. Molder: Nylon Molded Products Corp., Cleveland.

where POWER is important...

KOPPERS POLYSTYRENE!

Koppers Polystyrene 81 was used for the molding of the case for this jet aircraft battery. Made by Stokes Molded Products, Inc., Subsidiary of Electric Storage Battery Co.

● There are hundreds of power applications in the electrical field in which Koppers Polystyrene pays its way. It is being used successfully for battery cases, covers and vent plugs, for radio coils and transformer structures . . . wherever a high heat distortion point and dielectric strength are prime requirements. To these important characteristics may be added the advantages of dimensional stability and resistance to chemicals and moisture.

And Koppers Polystyrene is easy to work with. Fewer weld lines, improved strain pattern, more uniform plasticizing of material in cylinder, faster cycles resulting from setting at higher temperatures, more uniform cylinder feed . . . all are the result of the excellent molding characteristics of Koppers Polystyrene.

Write for further information. As always, we want to work with you to obtain the best results from your use of Polystyrene . . . to solve your particular molding problems (with special attention to military end uses) . . . to design new products to be made from Koppers Polystyrene when the supply situation again becomes more normal.

KOPPERS POLYSTYRENES give you all these advantages

- Low cost
- Light weight—more pieces per pound
- Excellent dimensional stability
- Excellent electrical properties
- Heat-distortion temperature range: 165°-200°F.
- Good chemical and moisture resistance
- Tasteless and odorless
- Unlimited color range

KOPPERS

Koppers Plastics

Koppers Polystyrene has made Many Products Better and Many Better Products Possible.

KOPPERS COMPANY, INC., Chemical Division, PITTSBURGH 19, PA.

SALES OFFICES: NEW YORK • BOSTON • PHILADELPHIA • CHICAGO • DETROIT • LOS ANGELES

COMPLETELY NEW!

the book that "short-cuts" the way to better, faster moldmaking

TIPS FOR THE BUYER OF PLASTIC MOLDS

. . . to help you purchase molds that will fit your requirements "like a glove"—that will pay off in greater production of perfect parts.

PROBLEMS TO CONSIDER IN PLASTIC TOOLING

. . . thoughts on how to effect the proper balance between engineering, artistic, sales and profit requirements.

ANSWERS TO QUESTIONS COMMONLY ASKED

. . . questions such as: "What is the best hobbing procedure?", "How can polished surfaces be protected against scale during heat treatment?", and many others.

WHICH MOLD STEEL SHOULD BE USED

. . . to deliver better results and lower molding costs. Complete selection data as to properties and working characteristics of various mold steels . . . along with easy-to-use heat treating instructions.

INCLUDING FULL-PAGE SELECTOR TABLE

. . . quick reference information to help you select the steel best suited for top results. Simply decide which combination of properties you need and the table does the rest.

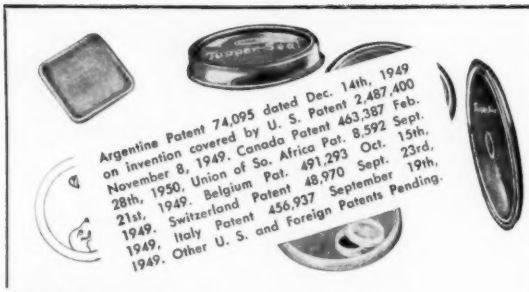
ALSO useful tables, hob steel recommendations and other valuable information that will help you get maximum results from every pound of steel you use.

"Tooling Up For Plastics", a brand new 42-page book of practical information, puts better, faster, more economical moldmaking procedures in your hands. Packed with factual data to help you get the most from every pound of steel you use. For your personal copy of "Tooling Up For Plastics" drop a note on your Company letterhead, indicating your title.

The Carpenter Steel Company, 112 W. Bern St., Reading, Pa.

Export Department: The Carpenter Steel Company, Reading, Pa.—"CARSTEELCO"

Tupper Seal, air and liquid tight flexible covers fit, and are included in the sets of all Tupperware Canisters.



Argentine Patent 74,095 dated Dec. 14th, 1949 on invention covered by U. S. Patent 2,487,400 November 8, 1949. Canada Patent 463,387 Feb. 28th, 1950. Union of So. Africa Pat. 8,592 Sept. 21st, 1949. Belgium Pat. 491,293 Oct. 15th, 1949. Switzerland Patent 48,970 Sept. 23rd, 1949, Italy Patent 456,937 September 19th, 1949. Other U. S. and Foreign Patents Pending.

TUPPER! Seals

air and liquid-tight, flexible covers for Tupperware Tumblers, Canisters, Wonder Bowls, Cereal Bowls and many another container of glass, metal and pottery, the contents of which it is desired to keep fresh and wholesome.

TUPPER!

The Tupperware 50 oz. Canister is "standard equipped" with the Tupper Seal, air and liquid-tight flexible Pour All cover.

The Tupper Seal, air and liquid-tight flexible Pour All cover is used on every Tupperware 20 oz. Canister.

FORMAL NOTICE! 9th November, 1949

EXCLUSIVE!

U. S. Patent #2,487,400

The Tupper Corporation has attained a position of leadership in this industry by incurring great expense and expending painstaking effort in the development, design, manufacture and exploitation of its many world-known products.

The Tupper Corporation further has anticipated the inevitable attacks to which leadership is subject and has taken measures provided by law to preserve the creative rights to its products, methods and design by patent protection both in the United States and abroad.

Tupper Seals for Tupperware shown in this advertisement are just a few of the forms covered in this manner and are specifically covered by U.S. Patent #2,487,400.

Only the Tupper Corporation, by U.S.Patent #2,487,400 has the right to make, use and vend container closures in connection with any and all types of containers throughout the United States and its territories as covered by the claims of the Patent.

Tupper Corporation will protect, according to law, the exclusive rights above granted

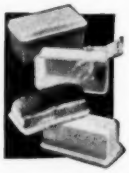
TUPPER CORPORATION

The Tupper Seal, air and liquid-tight, Pour All cover as a cover for 46 oz. cans; Tupperware Sauce Dishes and other containers of metal, glass or pottery. Foods easily dispensed without removing entire cover.

The Tupperware Wonder Bowls are usually fitted with Tupper Seal, air and liquid-tight covers.

There's a Tupper Seal, air and liquid-tight flexible cover for Tupperware 2, 5, 8 and 12½ oz. Tumblers too, and these Tupper Seal, covers fit many other containers of metal, glass and crockery.

The Tupper Seal, air and liquid-tight flexible Pour Top cover, specially designed as a dispensing cover for specified diameters of containers holding foods such as syrups, salad dressings, catsup.



The cover of the Tupperware Bread Server which serves as a bread tray also is designed to give similar results as Tupper Seal, air and liquid-tight Flexible covers. Keeps contents fresh as no other such container.

When equipped with Tupper Seal, air and liquid-tight, flexible covers, Tupperware Cereal Bowls serve many another purpose.

The Tupper Seal, air and liquid-tight flexible cover made for Tupperware 8 oz. Tumblers also fits and is sold with all Tupperware Funnels as a base when funnels are used as storage containers.

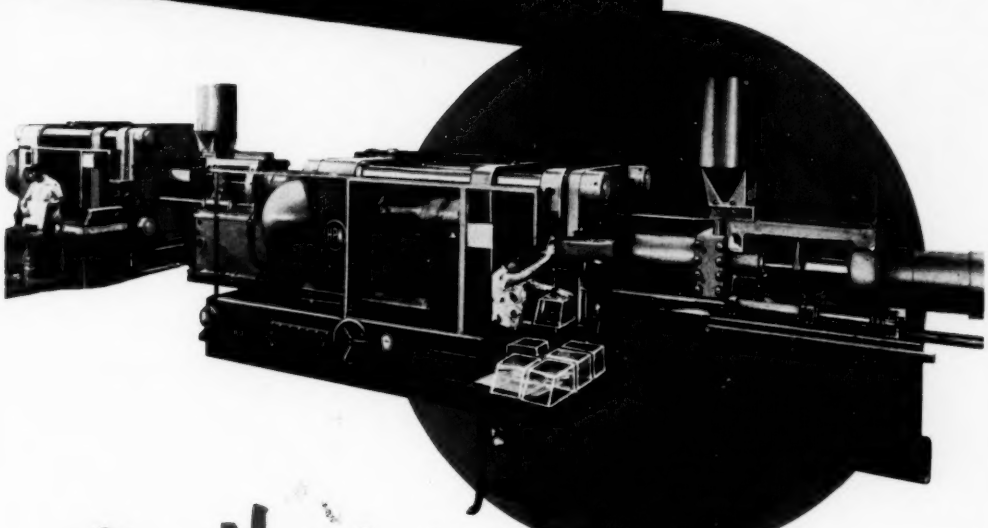
TUPPER CORPORATION

Manufacturers of — CONSUMER, INDUSTRIAL, PACKAGING AND SCIENTIFIC PRODUCTS

FACTORIES: Farnumsville, Mass., and Cuero, Texas **New York Show Rooms 225 Fifth Ave.**

ADDRESS ALL COMMUNICATIONS TO: Department B

More H-P-M "60s"



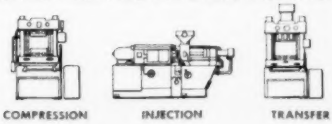
...On the job!

There's no better proof of a product's excellence than a satisfied user! And in this case, the user happens to be one of the country's largest injection molders . . . Ideal Plastics. This company recently installed two H-P-M 60s (shown above) for contract molding of large parts. Impressed with the dependability of these machines and their ability to turn out high production of quality parts, Ideal Plastics promptly ordered five more H-P-M 60s, plus several 9, 16 and 32 oz. H-P-Ms.

The choice of H-P-M 60s by other large injection molders . . . Bolta, General American, Santay, General Electric, Cruver, Victory, Federal, Consolidated Molded Products and many others, is based on the H-P-M 60's outstanding performance. Operating records and production figures speak for themselves. Remember, the new H-P-M 60 is designed for easy conversion to 200 oz. when you need it. Write today for details. H-P-M STANDARD SIZES—9, 16, 32, 60 AND 200 OZ. CAPACITIES.

HPM

PLASTICS MACHINES FOR EVERY MOLDING JOB



COMPRESSION INJECTION TRANSFER

THE HYDRAULIC PRESS MFG. CO.

1010 MARION RD., MT. GILEAD, OHIO, U. S. A.

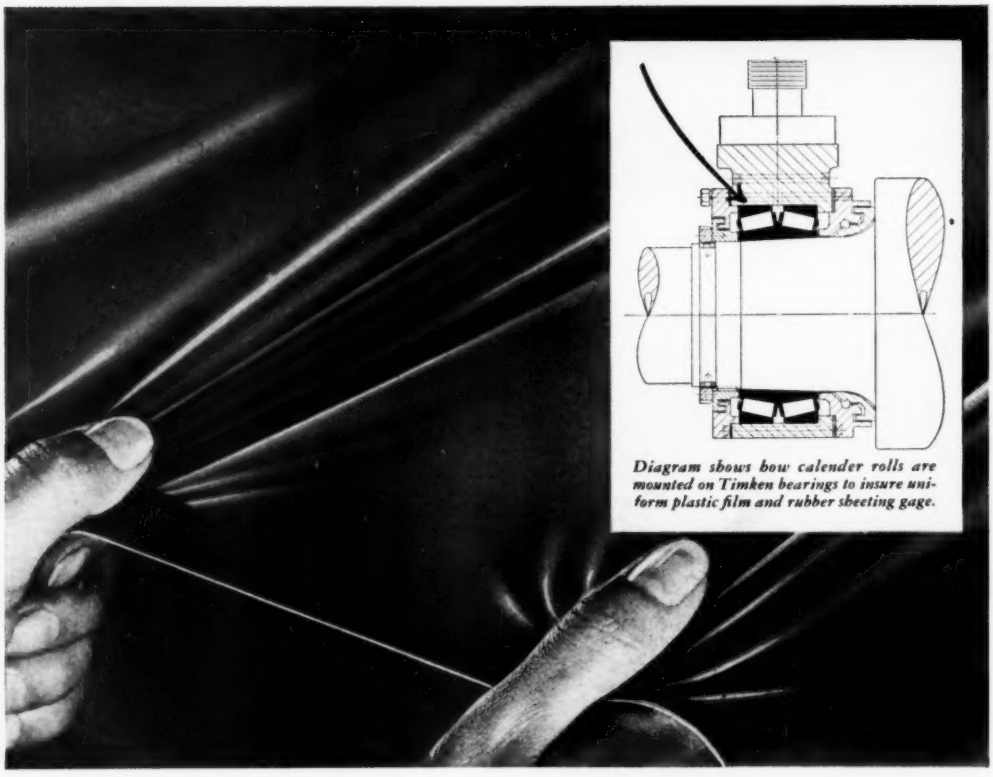


Diagram shows how calender rolls are mounted on Timken bearings to insure uniform plastic film and rubber sheeting gage.

How TIMKEN® bearings keep plastic and rubber gage well in hand!

NOW it's possible to get precision control of plastic film and rubber sheeting gage. Timken® tapered roller bearings, mounted on your calender rolls, will give you high quality sheets of uniform thickness with no variation in color shades. And your losses due to rejects and too-thick sheets will be cut to a minimum.

Timken bearings may be properly adjusted at installation to allow for roll expansion when the calender rolls come up to operating temperature. Since rolls are held in positive alignment, vertical roll movement is minimized, calender precision maintained.

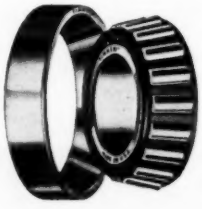
And this precision lasts! Timken bearings provide greater roll rigidity because they carry the heaviest loads—radial, thrust or any combination. And Timken bearings will help cut your maintenance costs.

No other bearing can give you all the advantages you get with Timken bearings on calenders, mills, refiners and mixers. For full information write The Timken Roller Bearing Company, Canton 6, Ohio. Canadian plant: St. Thomas, Ont. Cable address: "TIMROSCO".

TIMKEN

TRADE MARK REG. U.S. PAT. OFF.

TAPERED ROLLER BEARINGS



NOT JUST A BALL ○ NOT JUST A ROLLER ▭ THE TIMKEN TAPERED ROLLER ▭ BEARING TAKES RADIAL ◫ AND THRUST ←◫→ LOADS OR ANY COMBINATION ✳

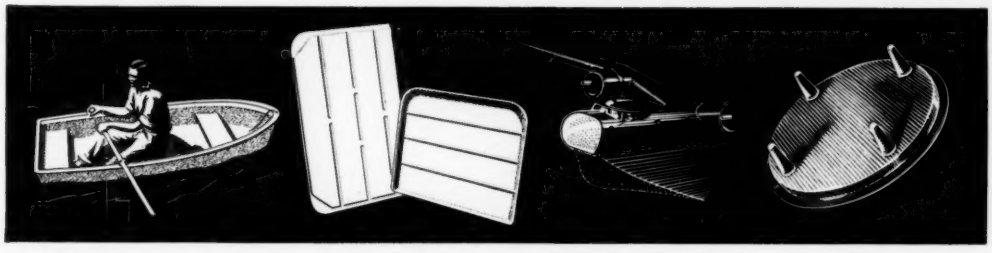
YOU TOO, MAY FIND NEW BUSINESS OPPORTUNITIES IN

REINFORCED Polyester PLASTICS

BAKELITE Polyester Resins constitute a fast-growing branch of the plastics industry. These resins are used in the production of reinforced plastics, chiefly with glass fiber mat or woven cloth. When properly formulated and applied they produce truly structural plastics with high strength-weight ratios that compare favorably with aluminum and steel. Present applications include boat hulls, refrigerator panels, radar housings, tote boxes, luggage.

In general, BAKELITE Polyester Resins provide excellent resistance to moisture, many chemicals, heat and cold. Certain types have excellent electrical characteristics including electrical "transparency" for radar housings. Another type can be cast into strong transparent solids. Another type is highly flexible and is used to impart added toughness to the other Polyester Resins. Inorganic fillers can be incorporated in certain of these resins to reduce costs and to minimize cracking and crazing.

Because BAKELITE Polyester Resins are "tailor-made" to meet widely different chemical, physical, and electrical requirements, Bakelite engineers will gladly assist you in choosing the right resins or combinations of resins for the intended end use. Write Dept. CL-13 for technical assistance and for latest data on the principal BAKELITE Polyester Resins now being marketed.



BAKELITE Polyester Resins are products of a continuing program of research and development. The principal grades now offered are:

High Viscosity Polyester Resin QRS-179 An excellent casting resin. May be prepared at room or elevated temperatures.

Med. Viscosity Polyester Resin QRS-147 A general purpose liquid resin with very good molding characteristics and excellent electrical properties. Adaptable to molding at room and elevated temperatures.

Low Viscosity Polyester Resin QRS-176 A low viscosity polyester resin which can be efficiently drawn into laminating layup under vacuum.

Heat Resistant Polyester Resin QRS-142 Generally similar in properties to QRS-147, it is designed to yield higher heat distortion points according to ASTM D 648-45T test method.

Flexible Polyester Resin QRS-136 For application where flexibility is desired. Also is completely compatible permanent plasticizer with other polyester resins to impart special properties.

BAKELITE
TRADE-MARK
POLYESTER RESINS

TRADE MARK

BAKELITE COMPANY
A Division of
Union Carbide and Carbon Corporation
UCC
30 East 42nd Street, New York 17, N.Y.

THE GENERAL TIRE & RUBBER COMPANY

Luxon,

the wonder film, is wonderful...

Luxon

PRODUCT OF THE
GENERAL
TIRE & RUBBER CO.

QUICK FACTS ABOUT Luxon

- A tougher, longer-wearing plastic film of uniform gauge.
- Made of 100% virgin vinyl resins and premium plasticizers.
- Resists fading and clouding in sun and after repeated washings.
- Available in 54" and 36" widths. Wide variety of colors . . . opaque, clear and translucent. Plain and embossed. Other widths available.
- Lies flat on cutting tables, cuts and sews like a fabric.
- Seals uniformly, for permanent, smooth straight seams.
- Silken-finished, electronically, for better color printing and a quality "fabric-like" feel to the hand.
- Backed by the research facilities and quality reputation of The General Tire & Rubber Company, Akron, Ohio.

HOW TO BEAT THE HEAT IN A PHENOLIC MOLDING

Use Borden's DURITE.

The heat transferred to the distributor cap shown above sometimes raises its temperature to 250 deg. But this cap can take it. In that heat, it not only maintains its high dielectric strength, but also its flexibility and its remarkable resistance to oils, water and solvents.

The extraordinary *combination* of such serviceable qualities is obtained in Borden's DURITE HR-300. With DURITE HR-300, you can produce more parts, too. Its low, economical specific gravity of 1.39 makes for easier handling and moldability.

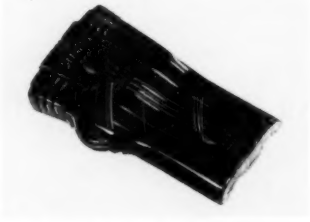
You can depend on all of Borden's DURITE compounds for the special properties you need. These compounds are made by the skillful application of cellulosic, carbonaceous, and mineral fillers to a resin base.

Address all your phenolic molding problems to The Borden Company, Chemical Division, Dept. MP-91, 350 Madison Ave., New York 17, N. Y.

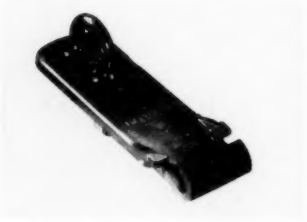
Borden's DURITE

Molding Powders · Bonding Resins · Cements

Smooth, black finish; good general strength and dielectric properties — provided by the Borden's DURITE phenolic for this switchbox.

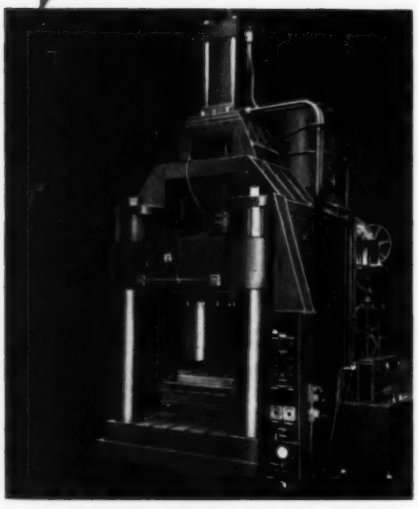


Good finish; resistance to heat conductivity; adequate dielectric strength — all provided by the Borden's DURITE phenolic for this appliance plug.



Lustrous finish; good general strength and dielectric properties — provided by the Borden's DURITE phenolic for this switch handle.

The "now-it-can-be-told"



J & C 200 oz. press installed at General Electric, Decatur, Ill.

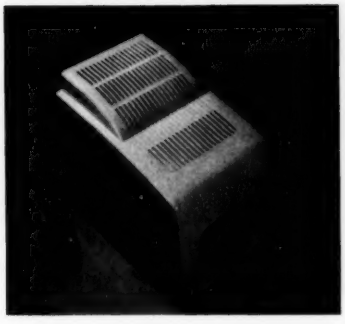
G. E. OPERATES PRE-PLASTICIZING LARGEST PARTS BY PERFORMANCE

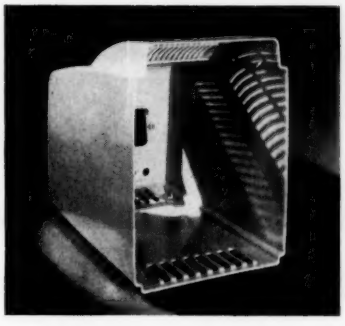
ENGINEERING DATA ON THE 200 OZ. JACKSON & CHURCH PRE-PLASTICIZING PRESS FEATURING THE HENDRY PROCESS

CAPACITY	208 oz. of polystyrene on 30 sec. cycle
POTENTIAL CAPACITY	300 oz. at 45 sec. cycle with substitution of 300 oz. chamber
PLASTICIZING CAPACITY	1200#/hr (1000#/hr on continuous basis)
SPEED OF INJECTION	180" per minute minutely flow-controlled down to 10" to 15" per minute
CLAMPING PRESSURE	2000 tons
INJECTION PRESSURE	100 tons
SPEED OF UNIT	410" a minute going up -- 475" a minute coming down (slowed up at both ends for clamping and knock-out)
WEIGHT	135 tons exclusive of oil
CAPACITY OF OIL RESERVOIR	1600 gallons
SCREW DIMENSIONS	6" diameter, 110" long
HEAT	76,000 watts split among six thermo-couples controlled by Thelco Regulators plus an additional 2000 watts on nozzle controlled by separate Thelco
TEMPERATURE CONTROL ZONES	Seven on 200 oz. machine, eight on 300 oz.
OPERATION OF INJECTION RAM	1000# line pressure driven forward with 122 gallons of oil per minute to develop 10,000 p.s.i. on material in chamber
DRIVES	Hydraulic unit--75 H.P., 1200 R.P.M. G-E motor extrusion unit--75 H.P., 1800 R.P.M. G-E motor extrusion screw--140 R.P.M. screw speed driven by water-cooled clutch
CLUTCH	Eddy current; comes on very slowly to 140 R.P.M., then coasts down very slowly

story at General Electric . . .

200-OZ. JACKSON & CHURCH PRESS . . . THEY INJECTION MOLD AREA AND WEIGHT IN THEIR HISTORY! SENSATIONALLY SUCCESSFUL!





Experimental television cabinet — 6 lb. gross, cycle time — 1½ minutes, and draw — 17¼ in. Shot at General Electric's Decatur plant on J & C 200 oz. press.

General Electric maintains its traditional leadership with Jackson & Church 200 oz. Pre-Plasticizing Presses.

Designed to produce plastic articles weighing up to thirteen pounds, the press can be easily converted to production of nineteen pound parts.

THE JACKSON & CHURCH 200 OZ. PRE-PLASTICIZING PRESS MAKES TOMORROW'S STANDARDS—AVAILABLE TODAY!

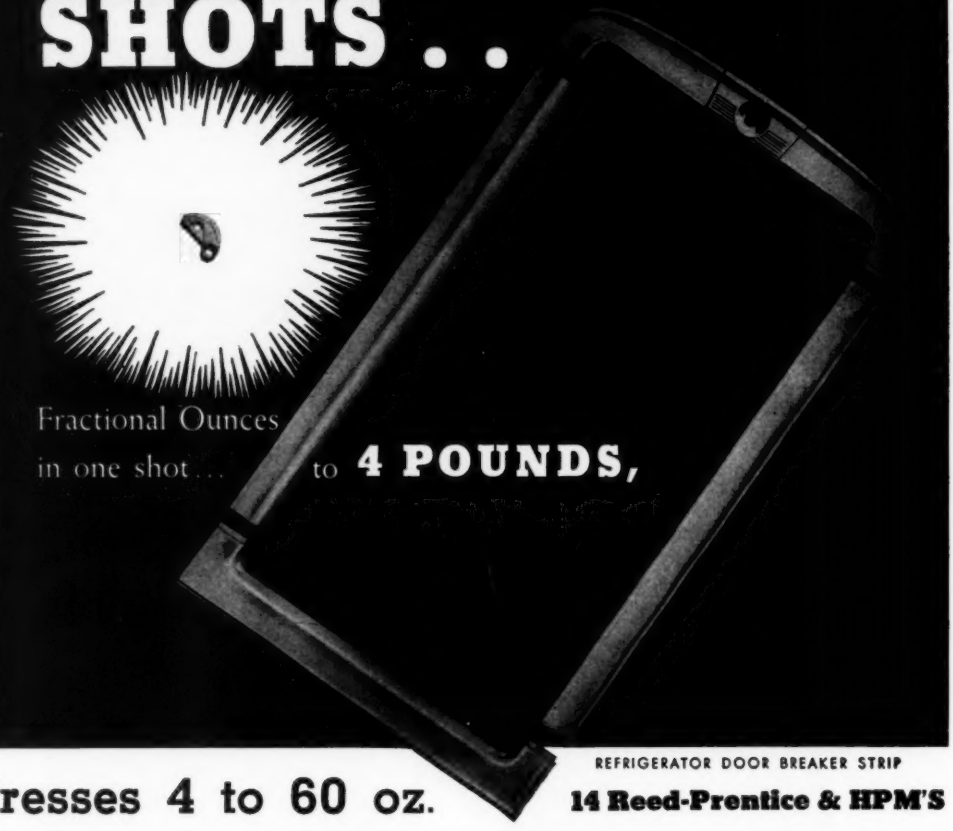
J-C

A PRODUCT OF

JACKSON & CHURCH CO. • SAGINAW, MICHIGAN

WORK WELL DONE SINCE '81

SHOTS . .



Fractional Ounces
in one shot . . . to **4 POUNDS,**

REFRIGERATOR DOOR BREAKER STRIP

Presses 4 to 60 oz.

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Commercial Plastics Co.
CHICAGO PLANT

National Plastics Co.
KNOXVILLE PLANT

Associated Plastic Co's
MIDLAND, MICHIGAN PLANT

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3 companies with 3 plants . . . with wide wartime experience in plastics production are ready to serve you. Write for list of over 200 leading U. S. Manufacturers who have relied on our Commercial Plastics, National Plastics, or the Associated Plastics plants in the last two years. Toughest molding problems solved with creative engineering skill, high quality, quick delivery, and right price. Let us help you. CONTACT US TODAY.

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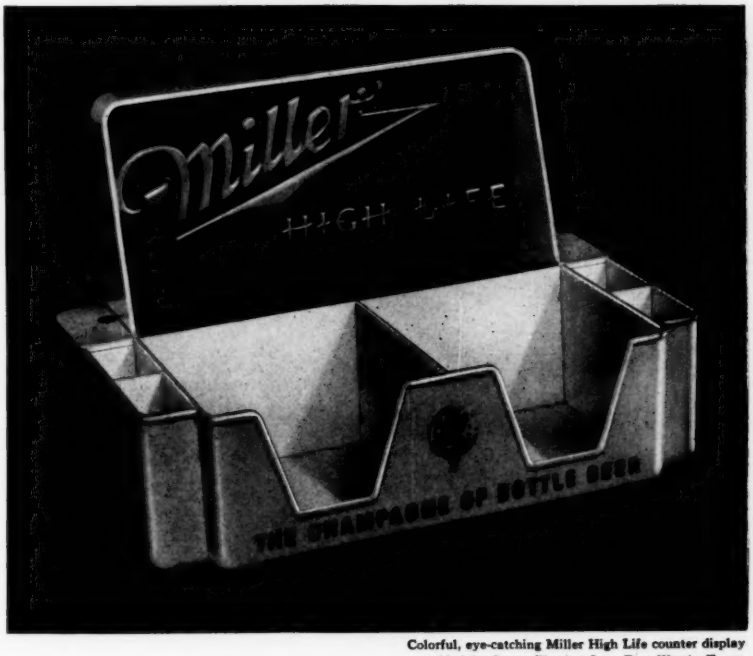
Merchandise Mart
Chicago 54, Ill.

ASSOCIATED PLASTIC COMPANIES, INC.



Colorful, eye-catching Miller High Life counter display —molded by Loma Plastics, Inc., Fort Worth, Texas.

"high lights" on decorative treatments of Lustrex styrene plastic

Printed decorations or special decorative effects can often add a touch of "black magic" to Lustrex styrene molded products.

Miller High Life, for instance, adds a spark of color to their sales—with printed decorations on the front of their molded Lustrex counter display, and photo-luminescent letters sprayed on the curved back surfaces (and illuminated by black light).

Monsanto has developed a wealth of material on lacquering, printing, decorating, metallizing, and destaticization of styrene molded parts. It's in booklet form . . . and yours for the asking.

And, remember: Monsanto produces a whole *family* of plastics with a big range of properties and performance characteristics . . . so, whatever your product, chances are there's a Monsanto plastic best suited to your needs.

For more information on the versatile Monsanto family of plastics; and for your booklet on "Decorative Treatments for Lustrex Styrene," please mail the coupon below.

Lustrex: Reg. U. S. Pat. Off.

MONSANTO
CHEMICALS—PLASTICS

SERVING INDUSTRY . . . WHICH SERVES MANKIND

MONSANTO CHEMICAL COMPANY,
Plastics Division, Room 2609, Springfield 2, Mass.

☐ Please send me your booklet, "Decorative Treatments for Lustrex Styrene Plastic."

☐ Please send me information on the big Monsanto family of plastics.

Name & Title

Company

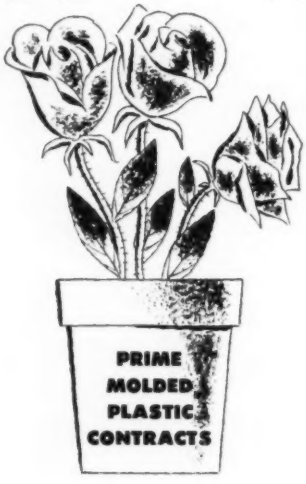
Address

City, Zone, State

AIN'T NATURE GRAND?

With tearful eyes, the molder said,
I might as well have stood in bed.
I'm not too bright, my die is cast,
Just want to mold, as in the past.

When Uncle Sam lets out a bid
I sweat and toil, clamp down the lid
On overhead and sales expense
And cut the profit down to cents.



And then the fatal day arrives
Who gets the bid? A man who strives
To make a living sewing shirts,
Or beds or files, or even quirts.

The lowest bid will take the cake
So says the law – forget the ache
Procurement has, and has it bad.
Six months from now – when nothing's had.

BOONTON MOLDING CO.

BOONTON, NEW JERSEY

NEW YORK OFFICE — CHANIN BUILDING, 122 EAST 42ND STREET, MURRAY HILL 6-8540

Skates go to the rink (and from the store) in this H & D corrugated "luggage" box

It doesn't take an ice skater long to see that this is more than "just a box"—it's also a handy carrier for his skates. The result? Easier sales for clerks who sell Spalding skates packed in this bright, linen-finish corrugated box. Styled like a smart piece of airplane luggage, this H & D box helps provide the "plus" that turns shoppers into buyers.

The H & D Package Laboratory is ready to add a sales "plus" to *your* product, too, by creating a package with after-sales use—or by providing better display . . . cutting wrapping costs . . . giving extra protection . . . increasing multiple or tie-in sales. For free booklet, "Pack to Attract," write Hinde & Dauch, 5105 Decatur St., Sandusky, Ohio.

H&D

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Authority on Packaging

FACTORIES IN: Baltimore • Buffalo • Chicago • Cleveland Detroit • Gloucester, N. J. • Hoboken, N. J. • Kansas City, Kan. • Lenoir, N. C. • Richmond, Va. • Sandusky, Ohio St. Louis • Watertown, Mass. Offices in principal cities.

"One of the surest ways to make money is to save money..."

CAPTAIN EDDIE RICKENBACKER

President and General Manager
Eastern Air Lines, Inc.

"... and the purchase of U. S. Savings Bonds through the Payroll Savings Plan is an easy way to save. It is good for the community. It is good for you because it means money available for a rainy day. Through the thousands of years that men have roamed the globe there have always been rainy days."

A vigorous exponent of thrift, Captain Eddie Rickenbacker made the Payroll Savings Plan available to his employees of Eastern Air Lines some years ago. From time to time, in personally dictated letters addressed "To All Members of Eastern Air Lines Family", he points out the individual and national advantages of the Payroll Savings Plan, and urges members of Eastern Air Lines Family "... to sign up on the Automatic Payroll Savings Plan. In years to come I am sure you will be mighty glad you did."

How about *your* Payroll Savings Plan? What have you done since Savings Bonds became Defense Bonds? What is your percentage of employee participation?

From coast to coast, companies large and small are installing the Payroll Savings Plan or revitalizing their present plans through person-to-person canvasses which put a Payroll Savings Application Blank in the hands of every employee.

Note the results of some recent person-to-person canvasses. Think what management efforts like this mean to the Defense effort. Then phone, wire or write to Savings Bond Division, U. S. Treasury Department, Suite 700 Washington Building, Washington, D. C. Your State Director will be glad to help you put in a Payroll Plan or show you how to conduct a person-to-person canvass.

Results of recent person-to-person canvasses to increase participation in Payroll Savings

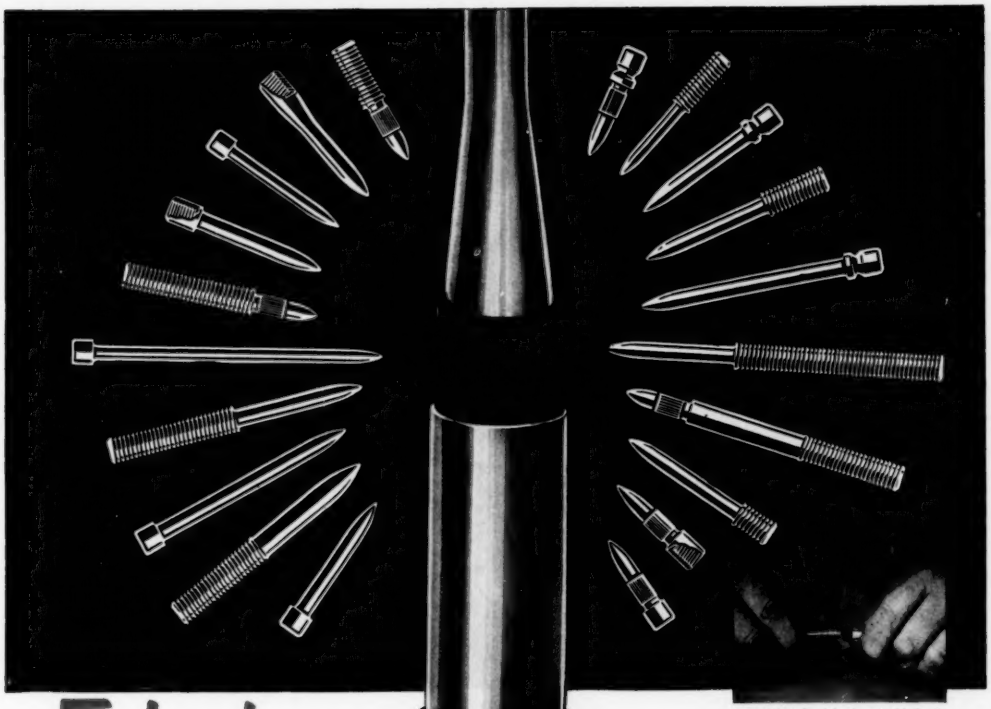
39 companies . . . total employees	487,347*
Employees on plan before canvass	81,481
Employees on plan after canvass	329,942
% of participation before canvass	16.8%
% of participation after canvass	67.7%
New savers added to plan	**248,461**

Based on National averages, employees in this group of companies are saving more than $7,000,000 every month in United States Defense Bonds.

**Includes 62,070 employees of six companies which did not have plan before canvass.*

The U. S. Government does not pay for this advertising. The Treasury Department thanks, for their patriotic donation, the Advertising Council and

MODERN PLASTICS



Ethyl CAPS THEM ALL!

Ethyl cellulose caps this cartridge, the ammunition for one of industry's newest power tools—the Remington Stud Driver. A tiny heelcap molded with Hercocel* E positions a hardened steel stud driven by an explosive force capable of penetrating structural steel $\frac{3}{4}$-in. thick.

For this demanding job, no other plastic affords, at comparable cost, all the advantages of Hercocel E. It won't crack or shatter when the Driver is fired. There's no pickup of the plastic in the gun barrel. Hercocel E will retain its shape under widely varying climatic conditions and during long periods of storage, yet is resilient enough to assure a snug fit for twenty different types of studs produced to commercial tolerances.

Hercocel E takes tough jobs like this in its stride. Perhaps this versatile, quality plastic can help you. Hercules will be glad to provide design and technical assistance in adapting it to your individual needs. Your inquiries are invited.

HERCULES POWDER COMPANY *Cellulose Products Department, 916 Market Street, Wilmington, Del.*

READY! Positioning stud in heelcap. Five colors identify different loads.

LOAD! Loading Driver. Triple safety device prevents accidental firing.

FIRE! Driver requires no auxiliary power, has minimum recoil.

MOLDABILITY
SHOCK RESISTANCE
DIMENSIONAL STABILITY
LIGHTWEIGHT
COLORABILITY

HERCULES Cellulosic Plastics

*TRADEMARK

Plastic heelcap molded with Hercocel E by Consolidated Molded Products Corp., Scranton, Pennsylvania, for Industrial Tool Division, Remington Arms Company, Inc., Bridgeport, Conn.

CPS1-7

Source of bright, colorful VINYL UPHOLSTERY

Increased consumer acceptance of supported and unsupported vinyl upholstery attests the desirability of attractive whites and soft pastels.

In vinyl upholstery TITANOX rutile or anatase titanium dioxides impart exceptional whiteness, brightness and opacity, and their compatibility with all types of synthetic or natural polymers helps maintain natural strength.

TITANOX-A, anatase type, is suggested where whiteness is of paramount interest. TITANOX-RA—the rutile type—is recommended for outstanding whiteness at low loadings. In heavily loaded stocks and in many tints, where the tinting strength of the pure oxides is not required, the rutile-calcium pigment—TITANOX-RCHT—may be used. All TITANOX pigments maintain bright, clean tints and their fine and uniform particle size affords easy mixing and grinding for complete dispersion throughout the polymer.

Our Technical Service Department is always available to help you with your problems in pigmenting all types of natural or synthetic polymers. Titanium Pigment Corporation, 111 Broadway, New York 6, N.Y.; Boston 6; Chicago 3; Cleveland 15; Los Angeles 22; Philadelphia 3; Pittsburgh 12; Portland 9, Ore.; San Francisco 7. In Canada: Canadian Titanium Pigments, Ltd., Montreal 2; Toronto 1.

8888

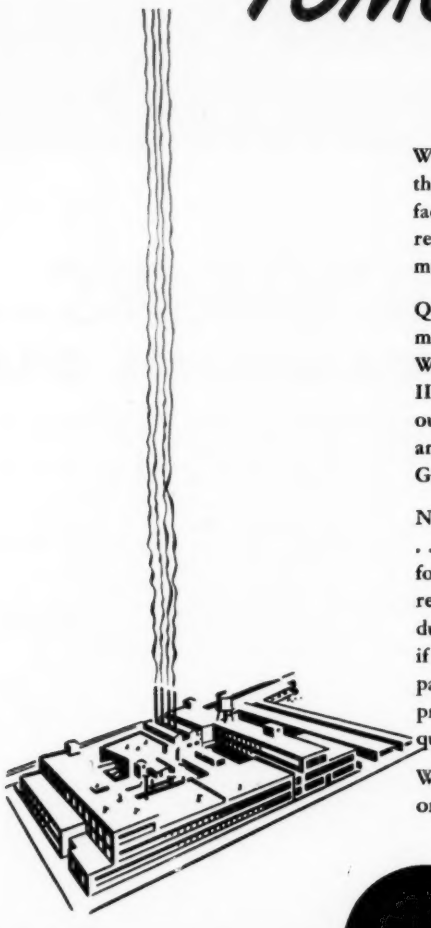
® **TITANOX**

the brightest name in pigments

TITANIUM PIGMENT CORPORATION

Subsidiary of NATIONAL LEAD COMPANY

Could you use a million molded plastic parts TOMORROW?



We're not joking! Not when you consider that General Industries' modern molding facilities are geared to meet *any* customer requirements—*in any quantity* even up to a million pieces a day!

Quite frankly, we have yet to produce a million pieces in a twenty-four hour period. We came close to it back during World War II, when General Industries was turning out proximity fuze parts, field telephones and a lot of other plastic parts which the Government needed *in a hurry.*

Now, we're seven years more experienced . . . we've added new equipment . . . we've found new production short-cuts . . . we're ready to go all out on that seven-figure production mark. In the meantime, don't worry if you need only a hundred or a thousand parts a day. You'll get the same dependable, prompt service, no matter what may be your quantity requirements.

We'll be glad to prove it, too. Write, wire or phone:

THE GENERAL INDUSTRIES CO. **DEPARTMENT R · ELYRIA, OHIO**

EP LUBRICANTS

safety to gears and bearings
loads and adverse conditions

FOR BEARINGS...
SHELL ALVANIA EP GREASE

FOR GREASE-LUBRICATED bearings, Shell Alvania Grease . . . the one grease that serves *all* grease applications in the majority of plants . . . *now is available with EP qualities added! . . . now even more Multi-Purpose.*

All of these unique advantages of Alvania Grease are therefore available for the first time to operators of machines subject to extreme bearing pressures:

1. Higher mechanical stability than any conventional grease at operating temperatures.

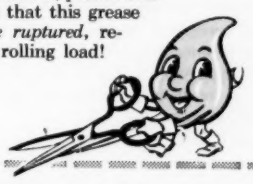
2. Pumpable at low temperatures . . . even through centralized lubrication systems.

3. Stable at high temperatures . . . no phase changes—still a grease at high temperatures—still a grease upon cooling.

4. Resistant to water . . . won't wash out.

5. Longer service life . . . reduced consumption.

Shell Alvania EP Grease is the answer to some of the toughest lubricating problems in industry. In rolling operations, for example, operators of steel, rubber, plastic and paper mills report that this grease film *just won't be ruptured*, regardless of shock rolling load!



Check the coupon and mail today for additional information about Shell Alvania EP Grease.

Shell Oil Company
50 West 50th Street, New York 20, N. Y.;
or 100 Bush Street, San Francisco 6, Cal.
Please send available data on
☐ Shell Macoma Oils ☐ Shell Alvania EP Grease

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SHELL OIL COMPANY

Cold molded parts are cured in baking ovens after molding at room temperature.

use Aico Cold Molded Plastics

a technique offering a low mold cost, a high rate of production from materials highly heat resistant

Aico Cold Molded Plastics are widely used for electrical parts that must withstand continuous exposure to high temperatures without distortion.

Cold molding was the original method of molding plastics. American Insulator, as a pioneer molder, has long maintained a complete cold molding department, fully equipped for efficient production from the compounding of both organic and inorganic materials to the finished molded product. Presses range from 5 to 200 ton capacities.

Aico's complete plastics molding service . . . all methods of molding with all types of materials . . . offers a sure cure for many of *your* production headaches. Aico is one of the few plastic molders in a position to make an unbiased recommendation on the most economical, suitable method of molding your plastic parts. Drop us a line today.

AMERICAN INSULATOR CORPORATION
NEW FREEDOM, PENNSYLVANIA

Aico's Complete Plastic Molding Service Includes:

ENGINEERING COUNSEL on proper molding methods and materials.

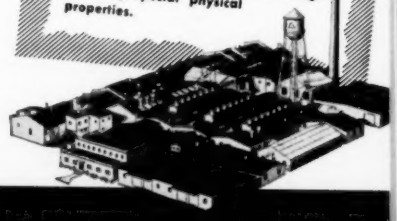
MOLD BUILDING to avoid division of responsibility.

INJECTION MOLDING for high rate of production . . . low unit cost.

COMPRESSION MOLDING of large parts with heavy cross sections.

COLD MOLDING of electrical parts requiring high heat resistance.

REINFORCED PLASTICS . . . a relatively new development in low pressure molding of reinforced resins . . . especially suitable for large moldings requiring special physical properties.



Aico plastics

A SPECIAL SERVICE TO MODERN PLASTICS READERS, REPORTING AND INTERPRETING THE LATEST NEWS AND DEVELOPMENTS FROM WASHINGTON AND ELSEWHERE AS THEY AFFECT THE PLASTICS INDUSTRY AND THE MOBILIZATION PROGRAM

Modern Plastics BULLETIN

August 17, 1951

Chemical Plants Delayed

Critics, half seriously and half facetiously, complain that a bombed-out Pittsburgh would cause no more confusion in industry than the present efforts to get CMP straightened out and running on the track. Furthermore, say some of the representatives of chemical companies whose job it is to find out what clicks in Washington, CMP people in Washington have built up a temporary iron curtain around themselves that defies penetration. The plastics industry is concerned because these chemical companies must be depended upon to provide the raw materials needed for plastics. The problem involved at the moment insofar as chemicals are related to CMP is: "Are the chemical companies going to get the structural steel which they need for plant expansion?"

Maybe . . . and Maybe Not

One industry man put it this way: "Maybe we will and maybe we won't get that steel—that's the maddening part of it. If we knew either one way or the other, we could at least report *something* to the home office.

And to make matters just a little more confused insofar as this writer is concerned, he was authorized to state that a high official of the Chemicals Div. of NPA asserted that no chemical company had proved it was going to be hard hit for lack of structural steel in the fourth quarter. The trouble is that no one knows because they don't know whether or not they are going to get what they asked for, but the prospects are far from bright.

Chemicals for Plastics May Be Slowed

Chemicals of interest to plastics that might be involved in this threatened construction slow-down include naphthalene, phthalic anhydride, chlorine, styrene, and phenol. Benzene probably won't be hurt much since most of the new construction to bring in benzene is for petroleum plants, and they can get steel; petroleum is the new "Sacred Buffalo" of this emergency just as rubber was the "Sacred Cow" of the last emergency—is still "sacred," for that matter. Petroleum and rubber can get most anything they want.

The point that alarms the chemicals industry most in this CMP allocation is that only 654,000 tons of structural steel are allowed in the fourth quarter for industrial and commercial construction of all facilities administered under NPA. Steel itself gets first crack at this tonnage to enlarge its plant—aluminum is second. What's left will be divided among all industry—there won't be much—and it will be a struggle between industries, all of whom think they are most essential. Even in the chemical industry, the crabapples will have to be separated from the Delicious, the Winesaps, Jonathans, etc., to determine which is most essential. Someone has to determine whether styrene, phthalic anhydride, phenol, naphthalene, etc., is most essential to the nation's defense. Supposedly, the decision will be made in the Defense Department.

Scores of complicated factors are involved that can hardly be unraveled in time to insure delivery of even all allocated steel in the fourth quarter. Not the least is the thousands of applications for steel that must be processed and sent to producers—some of those for structural steel are going out as we go to press and may give some indication as to the impending fate of chemical plants now under way or that were planned to begin in the fourth quarter of 1951.

More Steel by Mid-1952

Will the piddling amount of structural steel available for chemicals be allocated in useless driblets or will it be allocated to those plants far enough along so that a small amount will get the job done and bring production date for that one plant at least closer to realization? It does no good to yip about the amount of steel allocated for autos, refrigerators, etc., because that type of steel isn't wanted in structural work. The chemical industry especially needs wide flange steel—

there are only two companies producing it—and the struggle to obtain the limited amount available will be terrific.

CMP says the situation will ease early in 1952 but, again, the new steel increments may not be the tough type for structural work.

We try not to be alarmists, but the time limit in regard to obtaining more raw materials for more plastics certainly looks as though it will be at least three months longer than anticipated before many new plants can be finished or started.

If demand continues to rise, this will be a serious impediment; if demand levels off at today's market, the delay in construction might even be helpful in that it would give producers a chance to get their breath before the big upsurge that is expected when Defense Program purchasing reaches its peak some time later in 1952.

Everybody Wants Polyethylene

The only trouble with polyethylene today is . . . there "ain't enough." Here's the story, as clear as crystal. Trade estimates say that production capacity is between 5 and 5½ million lb. a month. Manufacturing difficulties, which will soon be overcome, have cut that amount by almost 400,000 lb. in July and 500,000 lb. in August. Both producers will have more soon when the plant difficulties are overcome. A new plant will start partial production in September or October; the balance of the new plant capacity will come in during November or December. But estimators say the additional material won't immediately equal a million lb. monthly nor as much as 2½ million if both companies are operating at capacity by the end of the year. Other new plant capacity can hardly be ready before late 1952 at best.

Demand was for 15 million lb. in June, 17 million in July, and 18.6 million in August. Comparison between supply and demand figures should answer a lot of questions.

The amount of polyethylene available in August was divided as follows: 42% for military use; 46% for essential civilian applications; and 12% was turned back to the producer to divide as he saw fit. Actually, 53% of total production went to military, but NPA officials dug into the small amount of inventory that was available and dished it out on the theory that new production in September would help ease the situation a trifle.

NPA Clamps on Restrictions

Shenanigans on the part of a few end users forced NPA to clamp down and enforce a more rigid allocation policy. Obviously, the offenders were newcomers or they would have known from war-time experience that they couldn't get by with such obvious attempts to obtain material under the "essential" classification and then divert it to something else. If a man had no history as a producer of film for frozen goods, but did use film for soft goods, it is certain that NPA is going to look closely at his request for a large order of film to be used for frozen food. And it couldn't help but be noticed that the number of manufacturers of camel-back suddenly multiplied. Camel-back and film for frozen food are essential; some operators seemed to feel that they could get the material simply by changing their specified use.

NPA has acted to disabuse end users of such ideas by more complete control of allocation. Instead of simply lumping his various classifications in the camel-back and frozen food programs, the processor must now list the name of each customer and how much polyethylene will be used for each purpose, except of course for the "free stuff" which the producer can distribute as he sees fit. The allocation for essential material in these two categories now extends by name and amount completely from producer to processor to end user—that is, NPA will know exactly how many pounds each user is going to put into camel-back or frozen foods. There won't be more than a specified amount, and if any of it gets into other end uses, the user will be in violation of the law and subject to a visit from Uncle Sam.

Essential Civilian Items

The essential items receiving consideration for August were: telephone toll cable; tire retread backing; film for frozen food containers and wrappers at the home and industrial level—that is, packers, frozen food lockers, and retail; mine drainage pipe; closures for chemicals and medicinals; bulk packaging for chemicals and pharmaceuticals, but not loose liners—only coated paper, multiwall bags, and attached lining. Unsupported film or sheet for this purpose was not allocated because there is no accurate requirement figure yet available. A given amount was assigned for bulk packaging of dried milk.

Military orders show little inclination to decline. The new increments of polyethylene will help the civilian situation to some extent, or at least until production of new military items gets going at full blast sometime next year. Among the newest military splurges are airplane tow targets made from polyethylene and now starting on large scale production.

Polyethylene For Packaging

The packaging industry is considerably perturbed over its inability to get more polyethylene. They want more of the essential goods quota, claim they only received 12.9% of all polyethylene for food and chemi-

cals and 1.6% for closures in August, plus whatever they received of the 12.9% available for the free market. The packaging industry advisory committee has asked for more and even wants to get it in a bulk volume and do its own allocating. Claims some of its plants will be forced to close if polyethylene isn't forthcoming. In addition to more for essential items mentioned in this column it wants additional quantities of tubing for fresh produce, shortening, candy, soft goods, spice bags, wax and paper coatings for bakery goods, molding material for frozen food containers and closures. The lack of molding material for container covers on polystyrene boxes for frozen foods has slowed up some injection molders who were producing thousands of styrene boxes. They are particularly desirable in frozen food locker plants where they are used for storing fruits and vegetables.

Styrene Brew

The polystyrene situation is quite calm in comparison to this same period a year ago, but there is some possibility of another eruption in the next six months if the increased rubber program goes through and if new facilities now under way are seriously delayed by lack of steel and equipment. Production has been running from 18 to 22 million lb. monthly, which is most favorable by comparison to last year.

There are some peculiar quirks involved in the situation, but perhaps they are typical of the emergency-type economy under which we are laboring today. Reports reach us that those who handle their companies' allocations at the producer level had just as tough a time supplying demand in August as any other month, yet nearly everyone admits that stocks are large. The best "limb-getter-out-on" remark we could get was from a producer who said: "We have had a few turnbacks on part of the amount we offered to big molders, but the smaller molders snapped up what the big follows didn't want." Some molders admit having large inventories, but claim they have molds ready to run which they will put on the press in September and which will quickly eat up their surplus. A visitor from the West Coast reports seeing large quantities of not only molding material, but finished goods in molders plants in that area.

Where is Polystyrene Going?

When asked: "Where is it all going?" the usual answer is: "More of the same thing." Refrigerator and television uses are down of course, but the former may come back strong if the CMP allotment of metal is big enough and if sales go up as a result of the easement of credit restrictions and the introduction of new models. Vacuum cleaners and washing machines are in about the same spot, with the possibility that high impact material may get some of the agitator business.

One of the best gains made this year will be in wall tile, which may require from 25 to 30 million lb. in comparison to 10 or 12 million lb. in the previous year. Reasons given for this big increase are general public approval after several years of doubt and the acceptance of Commercial Standards which standardized material and made it acceptable in building codes. The low cost of the styrene tile and the fact that the wall doesn't have to be reinforced to support it are helpful.

New Uses For Polystyrene

There are several other comparatively new applications on the way toward much larger volume, but they alone don't account for today's heavy demand. Among them are high-impact styrene pipe. It can't be used universally, probably not in petroleum fields, but for mine pipe it is a natural. Furniture is a good possibility, as are also military applications of the housing type. These latter are all for high impact material where cost is in the 40¢ range compared to the 30¢ range for regular styrene; low temperature brittleness is still a factor that hasn't been quite corrected, but the future looks good.

Phonograph records are making good progress—only a couple of million pounds now perhaps, but climbing. At four records to a pound, and hundreds of millions made every year, the industry is expecting eventually to take a good portion of the market. Bristles, especially the flexible type, are doing better than expected. Poundage is less than 5 million now—may go to 20 million in less than five years. An extruded glass-filled styrene laminate is also on the way, and polystyrene sheet is claimed to be climbing toward much bigger things.

Every producer is now working on new formulations for better impact and flame resistance. Some are on the market but haven't been announced; all will broaden the base for styrene.

More Styrene Monomer Needed

These examples are cited to show the need for ever increasing quantities of styrene monomer. Styrene was produced in May at more than a 700 million lb. annual rate. It is doubtful that 700 million lb. will actually be produced in 1951, but even more capacity may come in this year than the new that has already been added. Thus, even if the synthetic rubber program is increased late in the year, there could be more polystyrene produced in 1951 than in 1950.

Rubber Companies Want More Styrene

The biggest complaint about styrene today comes from the shoe sole producers and other users of high-

styrene butadiene resin. And right there is one of the nicest bits of irony to come down the pike in many a day. The largest rubber companies are all producers of this type resin; they are all very short and they all want styrene. The styrene producers wouldn't care a bit if those rubber companies transferred some of their styrene for rubber to styrene for shoe soles, floor covering, etc. But the styrene producers also produce polystyrene, and after they have provided the necessary amount for rubber to the rubber companies, they aren't going to rob their own styrene supply to give the rubber people more styrene for something else when they can use it very well themselves to supply the injection molding industry with polystyrene.

The polyester producers will probably continue to get the comparatively small amount of styrene they need because the Defense Dept. wants to keep them in business; their potential products will be sorely needed in war time.

Metal for Inserts

Molders are urged, begged, and warned to get in immediately their fourth-quarter requests for metal to be used for inserts, molds, and reinforcements. The deadline was Aug. 1, but perhaps something can be done even at this late date. Only 10 had applied to Washington by Aug. 9. This would include metal for such things as clasps on necklaces, garden hose couplings, toy parts, electrical parts, reinforcements for tote boxes, and a host of things. If the request isn't in soon the molder will get no metal under CMP in the last quarter.

Perhaps there is a misunderstanding on the part of molders about this need. If the molder needs less than 4000 lb. of copper, 100 tons of steel, or 1000 lb. of aluminum in the quarter he fills in CMP Form 4B and turns it in at his closest regional Dept. of Commerce office. He may only get a portion of what he asks for, but at least that will be something. If he needs more than the above listed amounts he must send the same form to the National Production Authority in Washington. If the metal parts are supplied by the customer the molder need not worry about his allocation.

An NPA official comments on the subject as follows:

"Only those manufacturers are concerned with CMP allotments who are either metal converters or have metal converters manufacture a metal component for them as a custom-made item for their use only.

"1. A plastic molder *is* responsible for obtaining priorities and/or allocations for those controlled metals which become a part of his final product in those cases where the controlled metal is purchased by the molder from a metal converter who has made the item specifically for the molder's own use, i.e., as a custom manufactured (Class A) product.

"2. The plastic molder is *not* responsible for obtaining allotment symbols and/or priorities for controlled materials used in fabricating his plastic products when such controlled material components are stock items with his supplier or are made by his supplier for others. (Such a component containing controlled material is a Class B product with the molder's supplier [controlled materials converter] and may be so regarded although it may not be specifically named as such in the CMP Class B Product List.)"

Dishes Under Fire

The Vitrified China Association is on a rampage. Melamine dishes are cutting into their market. Oodles of letters and mimeographed tracts are being sent to prospective purchasers of dishware, to politicians, and to the general public purporting to tell about the horrible things that will happen if we eat from melamine dishes. Even the old chestnut about formaldehyde and phenol fumes being exuded has been brought up. Only they now call it embalming fluid and carbolic acid. Soon no doubt the citizens of this country will have an epidemic of plasticitis and the undertaker won't even be necessary because they will already be embalmed.

We shudder to think what will happen to all the women who have been using phenolic iron handles or light switches or pan handles if they ever touch one again—that carbolic acid will burn 'em up for sure and the formaldehyde will pickle 'em good. Our friends in the competitive line apparently decided to pass up the one about cyanide. We wonder why. Perhaps they remembered the martyred New Hampshire rats that had to die by plain smoke suffocation because some one feared that melamine gave off cyanide in lethal quantities. The poor rats died from suffocation, sure, but smoke from burning paper killed them just as dead as smoke from melamine dishes or any burning material would kill them. How often do we have to disprove this canard about fumes from burning plastics anyhow?

But this is a serious problem. The Nazis and Communists have proved that some people will believe a falsehood if it is told often enough. Terrific pressure is being brought to bear to defame melamine dishes for public institutions, restaurants, and the Armed Forces. The plastics industry has a big stake involved. There are now three procurements involving 1 million lb. of melamine for the Army under way. Another totaling 1,800,000 lb. is pending. Continuing requirements are expected. If the industry doesn't take action —and take it promptly—to combat this constantly recurring type of carping, procurement officers for public service requirements may be forced to go back to chinaware and a promising new plastics development will have been nipped in the bud. It looks like a public relations job for a Trade Association.

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The New Textile Fibers

The impact of their development on the Plastics Industry

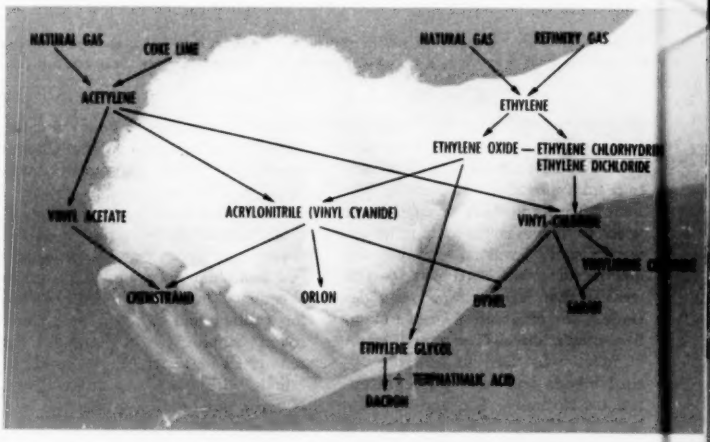
is a matter of great and far-reaching importance

FROM a standpoint of raw material use and availability, the synthetic fiber business is due to become one of the big "balance wheels" of the chemical field—including plastics.

The same materials—cellulose, acetylene, ethylene, acrylonitrile, chlorine, alcohol, and protein—are used in the manufacture of synthetic textiles and plastics. When a synthetic fiber is developed to the point of production efficiency and when forseeable markets are worthwhile, facilities for raw material manufacture are provided by chemical capital, and those facilities are generally of a stature well in excess of the early predicted needs of the fiber people. Automatically, more raw material is made available for plastics as well as for other end uses.

A good example is found in the present and projected expansion in acrylonitrile facilities. Du Pont is producing Orlon, Chemstrand is about to produce Acrilan acrylonitrile fiber, and Union Carbide and Carbon is mixing acrylonitrile with vinyl chloride to make Dynel. Thus acrylonitrile becomes a most important new material. Already the plastics divisions of three chemical companies are working on new thermoplastics in which acrylonitrile will be a major component.

At the other end of the economic machine as it affects chemicals, the synthetic fibers act as a balance against the violent and promoted price fluctuations in the speculative field of natural fibers. Simple economics plus, of course, improved materials and improved textile machinery, accounted for the tremendous growth of the rayon industry.

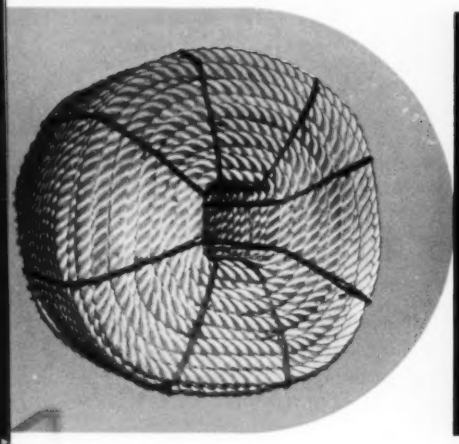


Simple market economics is the big worry of the wool producers today, because while wool will account for 30% of the dollar volume of textile fabrics sold in 1951, it will have only 10% of the poundage. Both these percentages are due to drop in 1952 and again in later years as new synthetic fibers come along to replace wool or improve it by blends.

A study of the present range of synthetic fibers will show this "balance wheel" position of the newer elements in the industry. The very reason for the number of new fibers now being sold and the greater number still under development is that no one fiber can be all things to all uses under all circumstances.

Both the chemical and textile in-

Courtesy Du Pont Co.
Dacron polyester fiber negligee resists wrinkling, will not shrink when washed



Nylon 8-in. hawser is ¼-mile long, weighs more than one ton, has a breaking strength of 105,000 pounds

Courtesy Du Pont Co.

Orlon acrylic fiber gives good service as pads for filter presses because of its resistance to mineral acids, weak alkalies, common solvents, oils, greases, and some types of salts

dustries learned a severe lesson in the mishandling of nylon in 1946 and 1947. The case almost paralleled certain misapplications of plastics. Nylon, with its terrific strength, was used in places where its qualities were sadly wasted—in evening gowns, for example. It was used in weaves that were not properly designed; for example, in those oven-like men's shirts. The magic name of nylon was used to promote absurd blends and even misrepresentations. No more! The end-use pattern of nylon is being straightened out. And great care is being taken by the chemical fiber companies to "police" projected end uses of the newer fibers.

A little over 1⅓ billion lb. of synthetic fibers will be consumed in 1951. This compares with 4¾ billion lb. of cotton and ⅔ billion lb. of wool.

The Range of Fibers

Rayons—viscose, acetate and cupra—will account this year for 94% of total U. S. synthetic fiber production. Surprisingly, over 25% of all rayon is used for tire cord.

Viscose rayon has great tensile strength, while acetate has softness and resilience, and today they are widely blended to take advantage of the combination of properties—as in rayon summer suits, for example.

Poundage-wise, **nylon** comes next to the rayons, but it is ranked as a poor second in volume. Nylon production is reported to be around the 100 million lb. mark, but the Chemstrand-Du Pont agreements will bring in a lot more within a year.

There are four kinds of nylon: multifilament such as that used for woven fabrics and heavier hosiery; fine monofilament such as is used in sheer stockings; high tenacity nylon for military and industrial uses; and nylon staple (short strands for making yarn) which is used in blends with wool and other fibers. Nylon's outstanding properties are strength and abrasion resistance, wet strength, quick drying, resistance to mildew and micro-organisms. Nylon molecules are light, and are bonded together at fairly long intervals.

Orlon acrylic fiber, made by Du Pont, has the properties of warm hand, bulking power, resistance to wrinkling, and dimensional stability. A straight acrylonitrile, Orlon is made up of smaller and heavier molecules than nylon, and they are bonded together at shorter intervals. Thus the Orlon fiber is stiffer and more resilient, more like silk. Orlon has exceptional resistance to sunlight and to acidic smoke and fumes. Its bulking power makes it a direct competitor of wool and makes it suitable for blending with wool. In the present continuous filaments, Orlon, because of its tight molecular structure, is very difficult to dye. In staple form, it dyes quite readily.

Textile sources estimate that by mid-1952 Orlon staple will be produced at a rate of 30 million lb. and continuous filament at better than 10 million lb. a year. While the acrylics are hard to dye, they bond well with resins, and that coupled with their ability to take outdoor life, should give them decided advantages in automobile tops, tents, sails, awnings, curtains, sports clothing, and work clothing, as well as in many industrial applications.

Acrilan, the new fiber to be made by Chemstrand Corp., jointly owned by Monsanto and American Viscose is, again, a fiber made from acrylonitrile; its reputed properties are parallel to those of Orlon.

Dynel, the new fiber announced by Carbide and Carbon Chemicals Co., is a copolymer of vinyl chloride and acrylonitrile. It is a further development of the company's former Vinyon-N. Alone among the acrylic fibers, it has flame resistance. It does, however, lack resistance to heat when temperatures rise above 240° F.

Dynel is also extremely resistant to water and chemicals and is already in wide use in marine applications and in such uses as laundry nets, dye nets, etc. In staple form, Dynel is a major candidate for the blanket field. A child's crib blanket made of this fiber can be dipped in full strength Lysol or Chlorox for sterilization and then rinsed in water, with no effect on the fiber.

Because of Dynel's bulk factor it

is also a natural for the expanding production of pile fabrics such as mouton and velour, as well as carpeting. Blended with wool, the stability of the vinyl-acrylonitrile combination along with its flame resistance and mothproofness, offers many new possibilities in blanket manufacture.

Of all the new fibers, Dynel is easiest to dye at date of this writing. One of the interesting possibilities in the use of Dynel fabrics is heat sealing instead of sewing. It is possible to form an electronic bond between vinyl film and Dynel fabric—and applications for outdoor use would be numerous.

Dacron, the third new Du Pont fiber, was formerly known as Fiber V and Amilar. It is a polyester, a condensation polymer of ethylene glycol and terephthalic acid. Its molecular building blocks are big and closely bonded, giving it possibly the highest crease resistance of any of the synthetic fibers, but making it most difficult to dye.

Dacron is virtually as strong as nylon and even more resilient, but it will not weather as well as the acrylic fibers.

Probably the prime consumer use of Dacron will be in the clothing field, particularly in men's suits. Numerous tests to date show that suits of Dacron can be worn in high humidity periods and even in the rain without wrinkling. Knitting yarns of Dacron give promise of having good elastic recovery and good shape retention in sweaters and hose. And the shirtmakers who made such a mess out of their use of nylon will probably find Dacron exactly what they are looking for! The high strength and stretch resistance of this fiber lend themselves to its promotion in thread manufacture. As a matter of fact, Dacron will do a superior job in sewing nylon and other fabrics.

Du Pont is currently building a plant, which by 1953 should produce 10 million lb. of continuous filament yarn and 25 million lb. of staple.

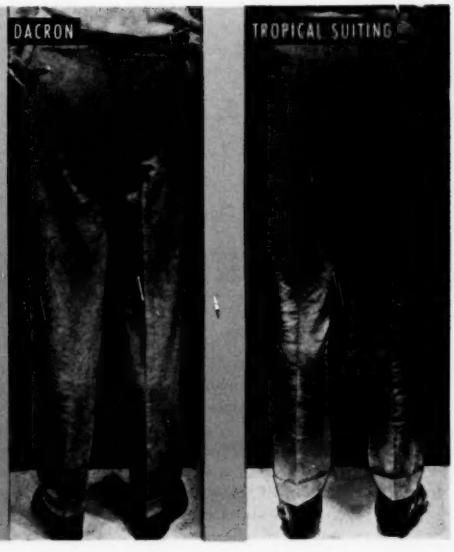
Another important new synthetic fiber is **Vicara**, produced by Virginia-Carolina Chemical Corp., which took over the facilities formerly used by National Dairy Products to make Aralac, the milk protein fiber which has now been discontinued. Vicara is a protein fiber, made from zein, one of the proteins in corn. Its chief use is as a substitute for and blend with wool, since it is light and soft; but it lacks abrasion resistance and durability. Properties are said to include good water repellency and crease resistance, and it is likely that its chief textile applications will be in the form of blends with stronger fibers.

Not strictly considered textile fibers, but nevertheless included in any picture of the economics of chemical fibers, are the monofilaments[1]: saran or vinylidene chloride, polyethylene, and nylon. Of these saran is by far the biggest and has become standard material for automobile seat covers and outdoor furniture. Normally, saran monofilaments are extruded in 12 gage, but more progress is being made on 8-gage monofilaments and

[1] "Progress Report on Plastics Monofilaments," MODERN PLASTICS 27, 69 (Nov. 1949).

Photos this page courtesy Du Pont Co.

Tiny tucks, trim collar, and non-puckering seams of Dacron blouse show tailoring advantages of the fiber



After three days of testing, Dacron trousers retain crispness; tropical fabric is wrinkled, out of shape

Bulk factor of Dynel makes it suitable for production of mouton-like fabric

Dynel copolymer fiber (left) is only acrylic fiber having flame resistance

Paint roller sleeve made of Dynel absorbs paint, applies it smoothly

Blanket of staple Dynel can be sterilized and rinsed with no effect on fiber

Photos this page courtesy Carbide and Carbon Chemicals Co.

even finer sizes are in the offing. Some experimentation has been done on saran multifilaments, but the results in textiles are inconclusive to date. Saran production within a couple of years is expected to reach 25 million lb. annually.

Polyethylene is in about the same position as far as monofilaments are concerned. In finer gages this resin is likely to lack strength as a fiber, but some progress has been made in its use in the 10- and 12-gage sizes.

Nylon heavy monofilament is, of course, a growing proposition in the brush trade as a replacement for bristle, and also has some electrical applications on record. There is in prospect increased use of the heavier monofilament with fine synthetic fibers of different kinds to produce combination textiles with specific physical characteristics.

Glass must naturally be included in any picture of synthetic fibers, and since the development of Coronizing, a heat treating process, by Owens-Corning Fiberglas Corp., domestic use of glass fabrics shows promise of rapid increase. The other large makers of fibrous glass for textile use are Libbey-Owens-Ford Glass Co. and Glass Fibers, Inc.

Not all of the general field of synthetic fibers has been covered in this article. We have omitted Plexon, which is a synthetic coated yarn, and Tensolite, a wrapped yarn which may be partly or entirely synthetic, depending upon the core.

The Future

W. H. Brown of American Viscose Corp. recently stated that the textile industry expects to have by 1954 an annual capacity of 400 million lb. of synthetic fibers in addition to about 1.7 billion lb. of rayon. This means that within the next three years the per capita consumption of man-made fibers in the U.S. will be almost 13 lb. or 30% over 1950 consumption.

To produce these quantities of synthetic fibers, there are now being built chemical materials plants and other facilities that will contribute much to the future of plastics. To produce still other fibers, at present only in laboratory stage, further facilities will have to be built.

A great deal of work has been done, for example, on the use of seaweed protein in the production of a synthetic fiber. The possibilities of butanediol, an acetylene derivative, are being explored. Further news in the fiber field may be expected shortly from styrene producers. Some of these new chemicals will turn out to be moldable; some will find outlet as film; some will move in the direction of coatings, adhesives and binders. All are plastics!

And this is only the beginning. As the American standard of living moves to new highs, as fiber requirements become more and more specialized, as competition between chemicals themselves intensifies, the field of synthetic fibers will expand and will provide expansion in the field of plastics.

Extruded Slide Fastener

FABRICATORS of vinyl film and sheeting have long recognized the shortcomings of the conventional metal-toothed slide fastener as a closure for garment bags, cosmetic kits, and numerous similar items made of vinyl. Such slide fasteners were the best closures available—and they worked well enough. But there has been a need for a closure specifically designed for use with plastics—a closure which would be as rustproof, as water-tight, as durable as the vinyl material itself, and which could be heat sealed to it.

The answer to this problem now seems to be in sight. It is an all-plastic extruded vinyl slide fastener invented in Denmark and patented in the U.S. and foreign countries. This fastener is now being manufactured in this country by FlexiGrip, Inc., New York, N.Y. The FlexiGrip fastener consists of two identical vinyl tapes or stringers extruded to close tolerances. Each stringer has two channels and two longitudinal ribs. Each rib has a sharp undercut on one side so that the two stringers are held firmly together once they have been forced together.

A slider molded of nylon is used to force the stringers together or open them. This slider was originally made of metal. But FlexiGrip is now convinced that a molded nylon slider is far more satisfactory.

Tests recently completed showed that the FlexiGrip fastener will withstand a pull of up to 40 lb. per in. without separating. These tests were carried out at a temperature of 72° F. and a relative humidity of 65 percent. Thus the fastener has sufficient strength for use in such articles as garment bags, blanket bags, food bags, cosmetic bags, purses, etc. Tests of the nylon slider revealed that it will open and close the fastener 200,000 times with no observable failures or harmful effect on the stringers or slider.

Because the FlexiGrip fastener is all-plastic, it is completely rustproof and corrosion-proof, and can be washed with the article to which it is attached. It is lighter in weight, neater looking, and more flexible than the conventional metal slide fastener. The vinyl stringers can easily be heat-sealed to vinyl sheet or film.

When it is closed, the fastener is water-tight and air-tight. The latter quality is demonstrated in the accompanying picture of a vinyl bag closed with a FlexiGrip fastener. The bag distends as pressure is put on the end opposite the fastener because the fastener does not allow air to escape.

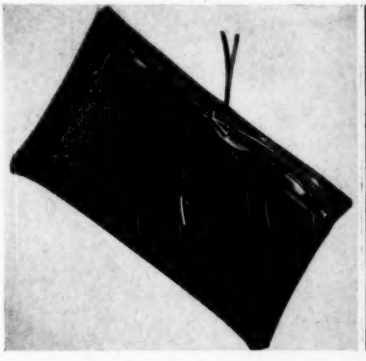
Because of its simplicity of design and the economies of the extrusion method of production, the FlexiGrip fastener is low in price and can compete with conventional slide fasteners. Further economies are possible because the vinyl fastener is available in continuous lengths. It is normally supplied on 200-ft. reels, but can be obtained on drums of up to 40,000 feet. The fabricator can then cut the stringers to length, and fit them with sliders and top and bottom stops. The fastener is also available cut to length and already fitted with top and bottom stops—but the continuous form is more economical for the fabricator.

Although the standard type and size FlexiGrip fastener will fill the majority of needs, the company is working on a number of variations for special uses. One such type is a fastener for applications where more than 40 lb. per in. of tension is likely to be encountered—such as tight-fitting skirts, corsets, or heavy suitcases. This fastener and a smaller one will be available soon.

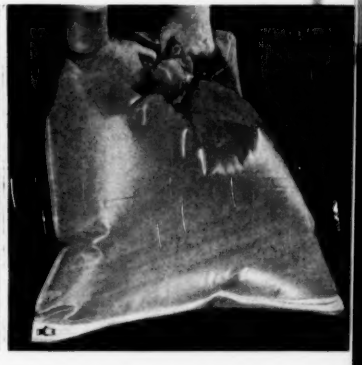
A FlexiGrip fastener suitable for use on materials other than vinyl is also in the development stage. This fastener may be extruded of nylon or some other plastic material. For special packaging purposes, the company is experimenting with a polyethylene stringer to be used in conjunction with polyethylene film. Such a fastener would make possible an air-tight, water-tight package which could (unlike a heat-sealed package) be opened and reclosed.

A variation on this application, for uses demanding high lateral strength, is a double fastener consisting of a conventional metal-toothed fastener with a FlexiGrip fastener outside of it. The former would provide the necessary strength; the latter would provide the seal. Such a double fastener could be opened or closed in one motion with a double slider now being developed by FlexiGrip.

Section of slide fastener which consists of two identical extruded vinyl tapes. Undercuts on ribs insure firm closure



Vinyl fastener has same desirable properties as plastic in pouch of which it is a part



Distention of bag under pressure illustrates air-tightness of vinyl fastener

STRUCTURAL BOARD

Above: New structural board can be manufactured with a variety of surfaces. Here, plain board is at top. Other surface treatments include paper; printed paper; wood veneer; high pressure laminates; cork; and aluminum

AN entirely new approach to the production of structural board from wood waste and plastic resin is offered by a process developed in England and now being introduced in this country through R. S. Aries & Associates, New York, N.Y. With this process, developed by Vere Engineering Co., Ltd., London, continuous structural board, called Celloboard, can be produced completely automatically for about one-half the price of standard fir plywood of comparable density and thickness.

The availability of wood waste and the properties of the structural boards which can be made from it have led many manufacturers to produce such board materials[1]. The accepted method of production is to subject the wood-resin mixture to heat and pressure in a multi-platen hydraulic press. This process has many disadvantages: each board must be handled as a separate unit; the press is idle during loading and unloading; all the heating must be done by conduction from the heated platens, a slow method; and the size of the platen limits the board size.

All of these disadvantages are eliminated by the Celloboard process. The press operates continuously, and the platen chains are never idle; radio frequency heating is used to speed up the cure of the resins; and the only limits on the length of the board produced is the size of building in which the press is operating, and the means of transportation.

The raw material is loaded in at one end of the production unit and is not touched until the finished board is cut to required lengths. One man can, if necessary, supervise a press which can turn out 48-in. wide board at a rate of 20 ft. per minute.

The fact that the press operates with a minimum of supervision and labor reduces costs of production considerably. Labor costs are from 1.5 to 6 man hours per 1000 sq. ft., depending upon the thickness of the board. As a result, Celloboard ¼ in. thick could be produced in this country to sell for about 5 to 6¢ per sq. ft. in carload lots (as against 10 to 11¢ for standard ¼-in. fir plywood). The fact that the press can produce a standard width board to any required length reduces waste and effects a further cost saving.

The board produced has a content of 95% wood waste material and 5% resin. Urea resin is used for most purposes, but phenolic resin can be used to produce a board for applications which require higher moisture resistance. The Celloboard press now being offered in this country can produce 48-in. board from 3/16 to ¾ in. thick (with a tolerance of plus or minus 0.03 in.) ranging in density from 0.5 to 0.75 (with a tolerance of plus or minus 1 percent).

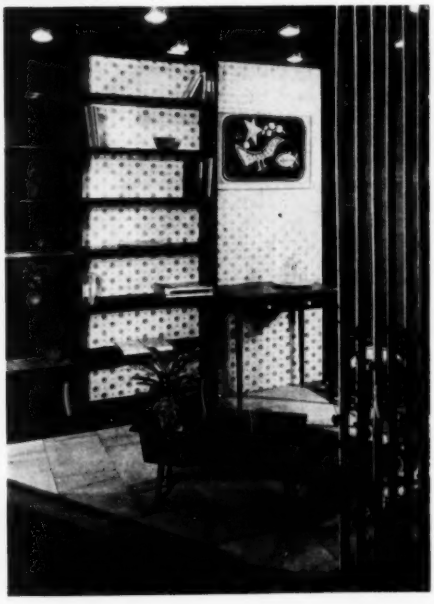
The machine also includes the necessary equipment for giving the board a paper surface at the same time that the board is being pressed and cured. This paper surface, coated or impregnated with the same resin used to make the board, can be either plain or printed with a wood grain or other suitable design.

Material Preparation

The Celloboard process is flexible enough to produce commercially acceptable boards for any market from

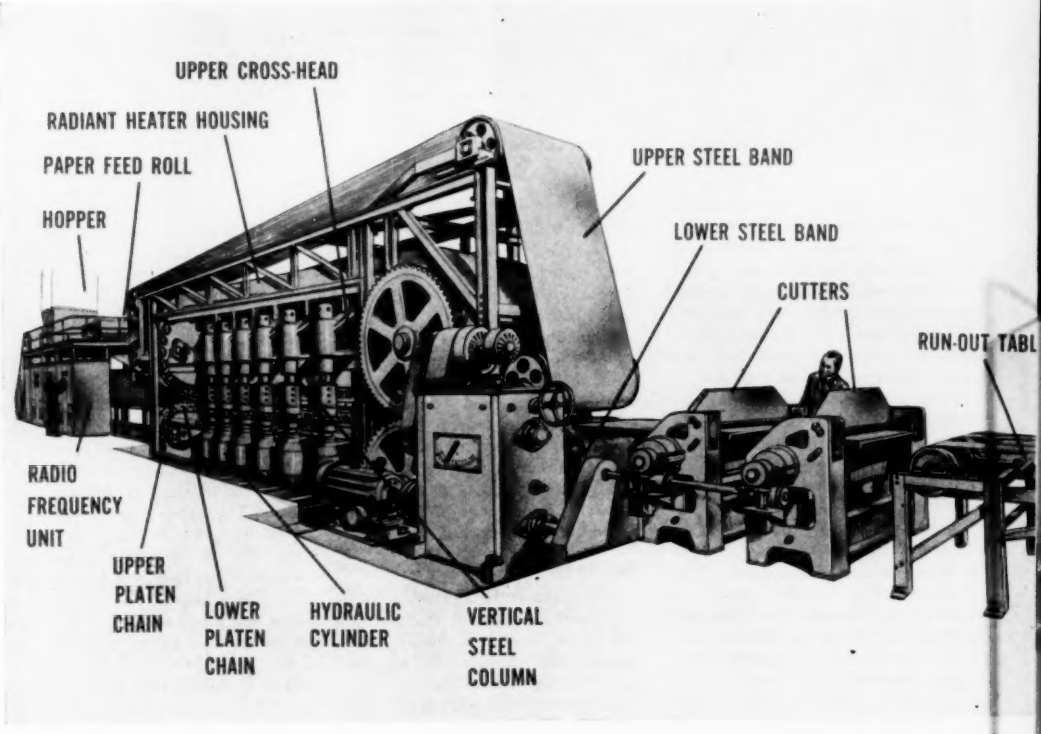
[1] "Resins Bond Wood Waste Board," MODERN PLASTICS, 26, 59, (Feb. 1949). "Improving on Nature's Wood," MODERN PLASTICS, 27, 64 (July 1950).

All illustrations courtesy Vere Engineering Co., Ltd.

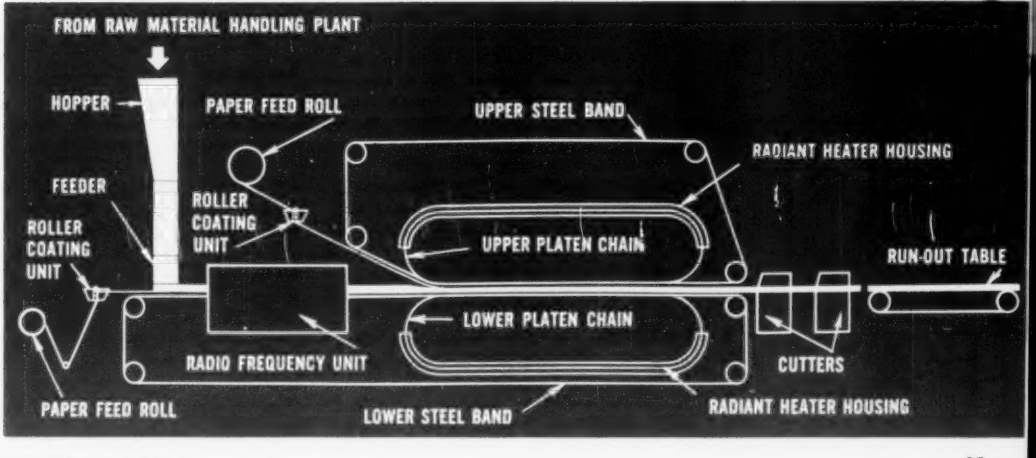


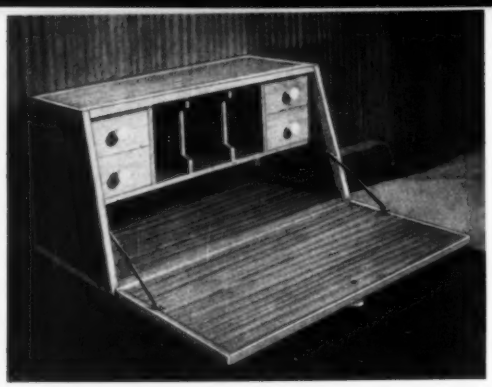
Right: Among home furnishing uses of surfaced wood-resin board are top and sides of coffee table (foreground), having metal insert for plant; and veneered top, sides, and drawer front of writing table (rear) with drawer bases of unsurfaced board

BY THE MILE ... made by new continuous and economical process is as workable as lumber, lends itself to variety of surface treatments, has many domestic and commercial uses



Operation of press for making structural board (delivery end shown above) is explained (below) by diagram arranged to relate to illustration of press, with raw material hopper at left and runout table at right. Guillotine cutters move with board, return after cutting





Board used in wall writing-bureau is of mahogany - veneered wood-resin composition. Drawers and partitions are produced of unfaced board

the widest range of raw materials. Pre-dried waste material, for instance, may need only grinding in orthodox hammer mills. Wet waste materials may require drying with or without simultaneous grinding. The particular raw material handling set-up will depend upon the particular type of waste available.

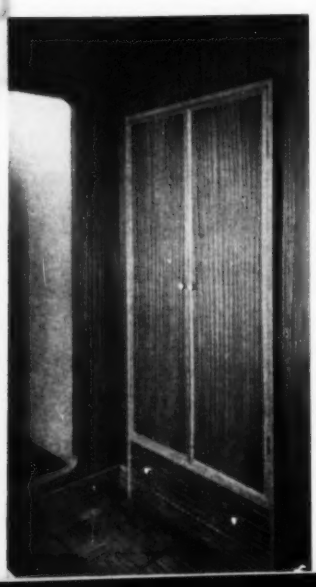
First step in Celloboard production involves equipment for dealing with small chips and shavings from kiln-dried lumber, where the initial moisture content is near 12 percent.

The wood waste is drawn from a dump through a surge bin by means of a regulated feeder and passed to a grinder. The grinder, usually a hammer mill, breaks the chips and shavings down to the desired size.

The ground material is then conveyed pneumatically through a cyclone to a double-deck vibratory screen which eliminates under- and over-sized material. The undersized material is bagged for subsequent disposal; the over-sized material is passed back to the grinder.

From the screen, the wood waste is fed into a storage bin fitted with an arch breaker and a controlled discharger, and thence to an automatic weighing machine. At this point, it is mixed with resin from a smaller automatic weighing machine and passed through a continuous mixer to the hopper of the Celloboard continuous press.

Doors, drawer, and interior of built-in wardrobe are of new structural board



Making the Board

The mixed resin and wood waste fed into the hopper of the continuous press goes to a feeder which spreads the material in an even layer on the lower stainless steel band of the press. This layer is six times the desired thickness of the finished board.

The steel band carries the carpet of material between the electrodes of a radio frequency unit, where it is preheated. When it emerges from the heater, the material meets the upper steel band and is passed between two endless platen chains, each of which is fitted with a thermostatically controlled radiant heating unit which can keep the platen at any temperature up to 160° F.

The platens compress the material to the desired board thickness and hold it at that thickness until it is completely cured. The board then emerges from the platens and is delivered to cutting units, where it is cut to length.

The two platen chains are composed of steel plates mounted so as to reduce friction to a minimum. The pressure loading is carried through to upper and lower steel cross-heads. Each pair of cross-heads is connected by vertical steel columns. The upper cross-head is fixed and the lower cross-head has hydraulic cylinders at each end so that it is capable of limited vertical movement.

Each platen chain is provided with a driving sprocket and an idler sprocket. The drive is by a 30-hp. electric motor operating through a gear box giving infinite variation between speeds of 4 and 30 ft. per minute.

Because the board must be cut to length while it is moving, the blades of the guillotine cutters are rigged so that they can move along with the board as they cut it. Two cutting units are used so that they can alternate, thus allowing each blade time to return to its starting point after each cut.

The press is also equipped with paper supply rolls which can be used to make paper-surfaced board. The lower paper is fed through a coating unit onto the lower stainless steel band so that the carpet of material from the hopper can be laid down on it. The upper paper layer is fed from its supply roll through a coating unit and joins the resin-waste material just before it goes between the platen chains. The coating units give the inner surface of the paper a coating of synthetic resin glue. The same type of resin used in the board itself is usually employed.

Fabric surfaces can be put on the board during the manufacturing process in the same manner as the paper surfaces are applied. Other possibilities include surfacing the board after manufacture with wood veneers, plastic laminates, cork, aluminum, or other sheet materials.

Applications

The end uses of Celloboard are as varied as the end uses of plywood or lumber in general. It can be easily cut, sawed, drilled, nailed, or glued with the methods and tools normally used to work with ordinary lumbers. Either in its natural form or faced with a decorative surface, Celloboard can be used for furniture, partitions, ceilings, kitchen cabinets, doors, flooring, store fixtures, etc. One Celloboard press can produce 16,000 tons of board per year. The potential market should be able to consume the output of hundreds of such presses.

Flexible Corrugated Ceiling

TRANSLUCENT, washable ceilings of rigid vinyl sheeting, heat-formed into continuous corrugated sections which are suspended below the actual ceiling of a room by means of a light-weight, quickly erected framework, mark an interesting new use for plastics in the illumination field. This efficient, attractive type of lighting installation, employed in conjunction with concealed fluorescent tubes, is relatively low in cost and readily adaptable to either new construction or existing structures.

Factories, drafting rooms, medical and dental offices, schools and retail stores are typical of the locations for which the new Acusti-Luminus ceilings are ideally suited. Thanks to the light weight of the 10-gage Vinylite material used for this application, installation is rapid and involves only a simple metal structure which supports the plastic at the proper distance below ceiling-mounted fluorescent fixtures.

Luminous Ceilings, Inc., Chicago, Ill., forms the corrugated material from continuous rolls of translucent white Vinylite sheeting, and also handles the complete installations. The corrugated plastic, cut in convenient modular lengths of approximately 15 ft., is held in position by means of T-section channels of light-weight angle iron. If desired, installations can also be arranged to include sound-absorbing acoustical fins which fasten to the lower side of the angle iron supports.

The corrugated light-diffusing material is made in standard widths of 3 ft., and is quickly unrolled into position on the supporting rails. The only fastening required is concealed clips which are used at the ends of each section. The fact that the plastic can be easily cleaned abolishes the costly and complicated maintenance usually associated with fluorescent fixtures. The sections are merely rolled up for washing, and can be rehung to dry. Immersion in a 1% detergent solution will clean all but badly soiled spots, which can be wiped off with the same solution, while bad grease or oil spots are easily removed with thinners and solvents. The manufacturer has also developed a special machine through which the sheets can be passed for continuous washing.

Method of Corrugation

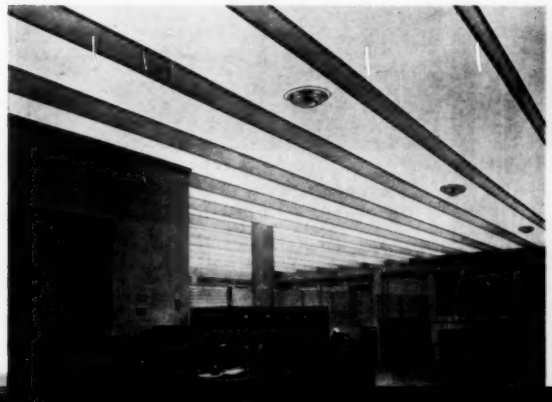
In corrugating the plastic material, the manufacturer passes the continuous web of thermoplastic sheeting through a device having a series of opposing rollers. Before entering the machine, the vinyl is heated to forming temperature. The process includes a method of waxing the vinyl, which reduces the electrostatic attraction of the plastic and makes it easier to clean. Upon emerging from the continuous forming operation, the material is sufficiently cool to retain the corrugated form, and is wound in rolls, ready for cutting into sections as required. The plastic can be easily cut with scissors or rolled and cut with a hacksaw.

This new approach to lighting offers a happy solution to the problem of deciding between a bare light source, which is efficient but hard on the eyes, and a shielded light, which is easier on the eyes but less efficient. With a false ceiling of translucent plastic material, interflectances are fully utilized and light is not trapped, with the entire ceiling becoming a source of glareless, shadow-free illumination, comparable to daylight. Light intensity can be regulated by varying the number of fluorescent sources above the plastic sections.

This type of ceiling treatment also provides an accessible cover for pipes, ducts, and valves, and eliminates the need for a specially decorated ceiling. Low in first cost (ranging from $1.35 to $2.00 a square foot for the complete installation), the sheet plastic ceiling is also much easier and more economical to maintain than a conventional plaster or acoustical ceiling. The vinyl material does not support combustion and is practical for all room temperatures. Unlike most lowered ceilings, this type of installation does not require extra sub-sprinklers, since it will automatically give way to water from a sprinkler system or a temperature of 140 to 150° F.

Properties of rigid vinyl sheeting which led to its adoption for this application include its moisture resistance, minute thermal expansion, excellent light transmission, and ease of forming at relatively low temperatures. In addition, the material does not deteriorate from age and is not affected by sunlight passing through ordinary window glass.

Corrugated rigid vinyl sheet for false ceiling is suspended by simple metal framework. Plastic provides light diffusion, serves as a decorative overhead



Rolls of 10-gage vinyl can be quickly installed. Lightness and flexibility permit sections to be removed easily for cleaning

Stud Driver Cartridges

Color coded ethyl cellulose heel caps are key components in new industrial tool which fires studs into wood, steel, or concrete

Photos this page courtesy Remington Arms Co., Inc.

New industrial tool kit consists of driver, studs, and cartridges with ethyl cellulose heel caps. Chart in box lid lists stud types, uses, and recommended powder charges

BUILDING and electrical contractors, maintenance engineers, plumbers, and ship fitters are understandably excited about an amazing new tool designed and developed by Remington Arms Co., Inc., Bridgeport, Conn.

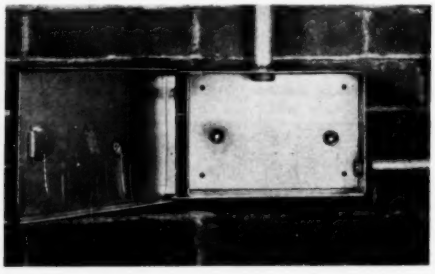
The tool is a stud driver, a device for firing studs instead of bullets in the rapid fastening of sheet steel to concrete, steel to steel, wood to steel, and wood to concrete.

The propellent is a tiny quantity of powder which generates controlled energy to drive a steel stud into a structural steel plate $\frac{3}{4}$ in. thick, or so snugly embed it into aged concrete that a pull in excess of 4000 lb. is necessary to remove it.

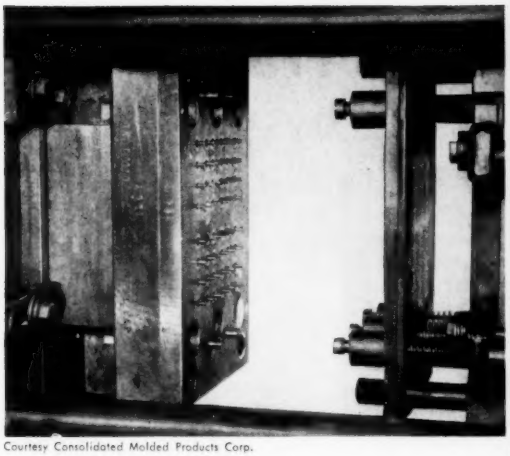
The tool is composed of the stud driver, itself, the cartridges, and the studs. A key component in the 32-caliber long rim fire blank cartridge is a Hercocel E ethyl cellulose "heel cap," which forms the end of the cartridge and into which the stud is pushed by hand to make a complete unit.

There are 20 different types of studs for all probable kinds of fastening jobs, depending on the type of material into which the stud is to be driven and on the head required (whether internal or exter-

Metal box is fastened to brick by driving steel stud through rear of box into wall. Low-recoil tool results in up to 75% saving in labor costs

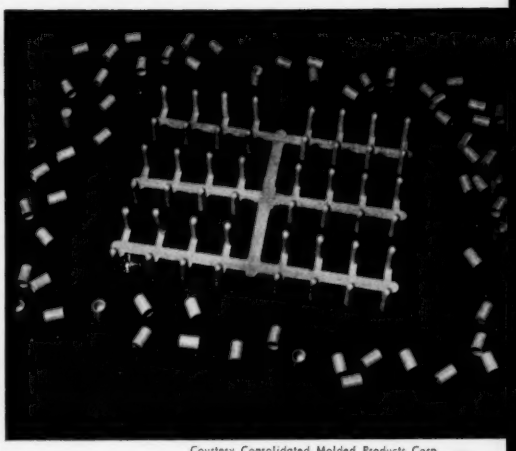


Pull of 4000 lb. would be required to remove steel plate box from brick. No previous hole drilling is needed for studs



Courtesy Consolidated Molded Products Corp.

Ethyl cellulose heel caps are made in 48-cavity mold. The heel cap exterior is round; interior is shaped to provide a positive grip on stud



Courtesy Consolidated Molded Products Corp.

Shot of plastic caps (center) with sprue and runners. Caps are made in five different colors to indicate different charges

nal thread is needed). For these 20 studs, there are five different types of cartridges, all exactly the same size, but containing different weights of propellent, and identified by five different colors of the ethyl cellulose heel caps—purple, red, yellow, green, and brown. The color indicates the powder in the cartridge, and the studs with which it should be used, as spelled out in a chart which comes with the tool.

Practically every plastic on the list was tested, at minus 20° F. to plus 150° F., for: a) cleanness of operation and no fouling of the tool; b) pressures up to 35,000 p.s.i. at velocities up to 1500 ft/sec.; c) retention of plasticity with a minimum of plasticizer; d) good moldability and accurate tolerances; e) flexibility to accept studs forced in by hand; and f) minimum absorption of nitro-glycerin, so that the energy potential might be maintained. Ethyl cellulose proved to be suitable for the application on all counts, and offered the advantages of economy and ease of molding.

The heel caps are produced in a 48-cavity mold by Consolidated Molded Products Corp., Scranton, Pa. The exterior of the cap is round, but the interior is not quite round so that the grip of the cap on the round stud is positive. In the case of threaded studs the cap remains in place to protect the thread after the stud has been driven until such time as further fastening by means of the thread is required.

Remington's engineers claim that the new tool can represent a saving in labor costs as high as 75% over other methods now employed. The tool can be comfortably operated at a speed of five or more stud settings a minute. Speed can be stepped up to five to 100 times as fast as other stud setting methods.

In use, the operator slips the end of the stud into the plastic heel cap of the proper cartridge, drops the loaded cartridge into the chamber, closes the tool, presses the neoprene-lined steel muzzle guard of the tool against the work to be fastened, depresses the safety button and holds it in that position with one hand, then fires the tool by squeezing the trigger with the other hand. There is little or no recoil, a noise about equivalent to that of a pop-gun, and complete safety in operation.

Remington Arms Co., Inc., a Du Pont subsidiary, has patents pending on the design features of the tool itself as well as on the heel cap component of the cartridge.

Volume of ethyl cellulose powder used is small—but the potential markets could be vast. In Denmark, highly suitable shotgun shells have been made from this material.

Courtesy Remington Arms Co., Inc.

Stud is slipped into heel cap on cartridge having the correct powder charge

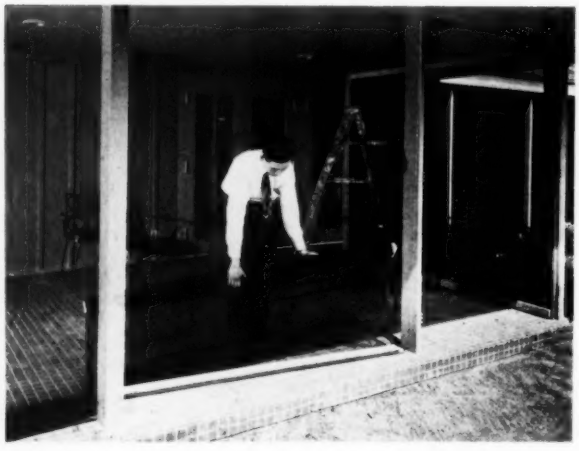
Wooden beams are fastened to concrete floor by studs fired from driver

Courtesy Remington Arms Co., Inc.

Screens Without Frames

Photos courtesy *House Beautiful* and Lumite Div., Chicopee Mfg. Corp.

Covered terrace of Pace-Setter House is screened with large panels of woven saran screening attached to hardwood bars at top and bottom, hemmed and grommeted on sides



Each panel can be rolled up for compact storage. Hardwood bars on top and bottom are easily screwed into place; rubber gasket seals cracks

A NOVEL installation of Lumite woven saran screening was made in the Pace-Setter House for 1951, built in Dobbs Ferry, N. Y., by *House Beautiful* magazine. The screens for the large covered terrace of the house are installed like old-fashioned touring car curtains and can be stored compactly because they have no frames.

The terrace screens are made in nine large panels which are attached to hardwood bars on top and bottom, but have no framing on the sides. The bars can easily be screwed into place, and rubber gaskets are used to make sure that there are no cracks between the bars and the floor or ceiling through which insects could enter.

Sides of the screens are hemmed and grommeted. The metal grommets, similar to those used on canvas awnings, are spaced 3 in. apart. They are snapped onto brass screws on the inside of the wooden uprights of the terrace.

This method of installation makes possible unbroken screen areas as large as 78 by 81 inches. When the screens are removed, they are simply rolled up on the hardwood bars. The entire set of screens for the terrace can then be stored on a shelf 8 ft. long and 30 in. wide. The set makes a pile (exclusive of the doors) only 1 ft. high on the shelf.

About 450 sq. ft. of 60-in. wide screening was used for the terrace. The dark green color of the Lumite harmonizes with the greenish-brown exterior of the house.

Metal grommets on hemmed sides of each panel are spaced 3 in. apart. Grommets snap over brass screws on wood uprights

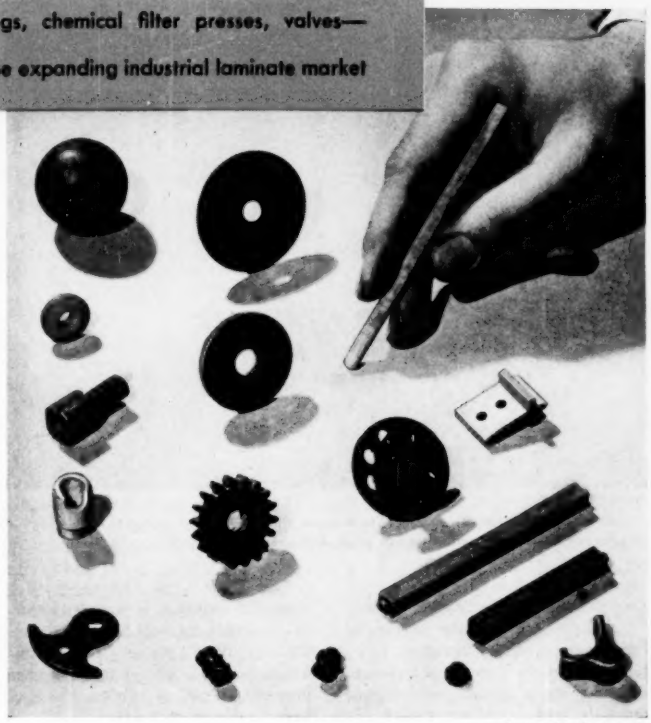
Far right: Entire set of nine panels can be stored on a shelf 8 ft. long and 30 in. wide; they make a pile only 1 ft. high

Laminates Unlimited

PART 2

Huge bearings, tiny bushings, chemical filter presses, valves—these indicate the scope of the expanding industrial laminate market

The first part of this article on industrial high pressure laminates, published in our July issue, covered three important categories—textile machinery, electrical, and refrigeration applications. That article also summarized the resins and fillers used in industrial laminates, and explained the reasons for using different combinations. The present article will explore many and diversified mechanical applications which range from tiny bushings fabricated from tubing ⅛ in. in outside diameter to immense bearings used on some of the largest steel rolling mills in the world.



Courtesy The Formica Co.

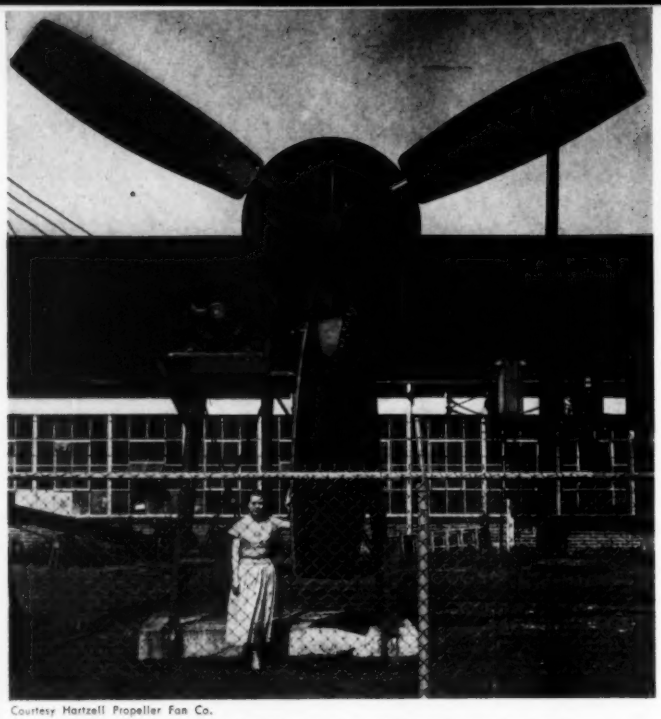
Products are made of laminates in a wide variety of sizes and shapes. Included in this representative group of machine components are gears, washers, valve parts, and bushings

EACH industrial application of laminates must and does stand on its own merit. This is true from the standpoint of tailored physical properties as well as from the all-important cost angle. And as the technology of this important branch of plastics continues to expand, so will its markets.

An outstanding example of the value of research and development work is found in the large propeller blades for huge fans which are used for cooling tower installations, in the oil industry, for experimental wind tunnels, and the like. Before World War II, these fans, as manufactured by Hartzell Propeller Fan Co., Piqua, Ohio, were fabricated principally of aluminum. The fans produced by that company range in diameter from 14 to 22 feet. When, during the war, the manufacturer had difficulty in obtaining aluminum, Panelyte Div., St. Regis Paper Co., was called in to compression-mold the blades from a plastic laminate. To make this switch, a sizeable investment had to be made in compression molding tools. In addition, the price of the molded blades was higher than that of blades made from aluminum.

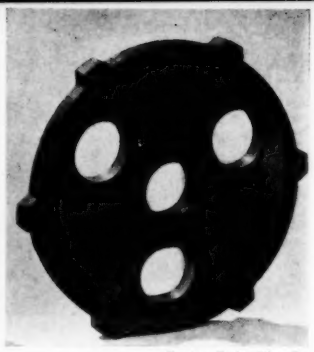
When the laminate bladed fans were placed in operation, they were found to have several points of superiority. For example, it was noted that the new material was not notch-conscious, it was not subject to corrosion fatigue (as was metal), and it dampened vibration. These propellers operated satisfactorily throughout the war years and after the war without failure, which, according to Hartzell, was a remarkable record. There was still, however, the cost factor, which engineers at Panelyte and Hartzell kept trying to overcome; there was always the possibility that some new aluminum or other alloy would be developed which could be used to produce propellers comparable with the laminated ones.

Post-forming, then, was the next logical step. A great deal of effort was directed toward the application of this technique to the propeller blade problem. Today, Panelyte produces finished propeller blade post-forming stock in sheets ½ in. thick at its plant in Trenton, N. J. This sheet material is shipped to Hartzell, where it is subjected to a patented post-forming process for shaping the blades to specification. By this system, the laminate blade became competitive cost-wise, and since the post-formed blade has all the physical advantages of the compression molded blade, Hartzell expects to



Courtesy Hartzell Propeller Fan Co.

Canvas base laminate blades for huge fan dampen vibration, are not subject to corrosion fatigue. Post-forming process made plastic blade competitive, costwise, with metal



Courtesy Taylor Fibre Co.

Soup filler disk is compression molded of phenolic-canvas base laminate

continue to use laminate for this.

Another factor in the successful conversion from molding to post-forming was the success of Panelyte in designing a special canvas base laminate with excellent non-directional strength for this application. This was done by using a canvas with identical wrap and twist.

Laminates and Chemicals

Another Panelyte development which satisfactorily meets many of the stringent requirements of the chemical industry is a new chemical-resistant canvas base laminate. Certain filter plates and frames which have in the past made use of wood, metal, or rubber, are now being made in this special grade of laminate. Difficulties with the former plates and frames brought about a very high replacement rate.

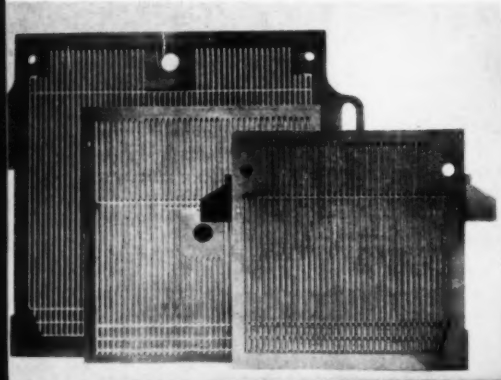
Field experience has subjected the new laminate parts to severe tests, and has proved the durability of the material. One large chemical concern advises that laminate plates and frames were installed on a press filtering a 30% solution of sulfuric acid at high temperature, and that "the plates and frames are standing up fine." The laminator did not recommend this material for such severe service, but the customer bought on his own initiative, stating that it was the best material that he could find for the purpose.

Although these laminate plates and frames are initially more expensive than wood, metal, or rubber, there are numerous compensating features. Since the material is much stronger and more rigid than wood or metal, laminated plates and frames may be made much thinner. Wood plates and frames are approximately 1½ in. thick, compared to the ⅞-in. thickness of laminate. Thus the effective filtering area for a given press can be increased by as much as 40 percent.

Company field reports indicate that since the laminate parts are designed with filtrate areaways to insure free and ample drainage, the flow rate of free filtering materials

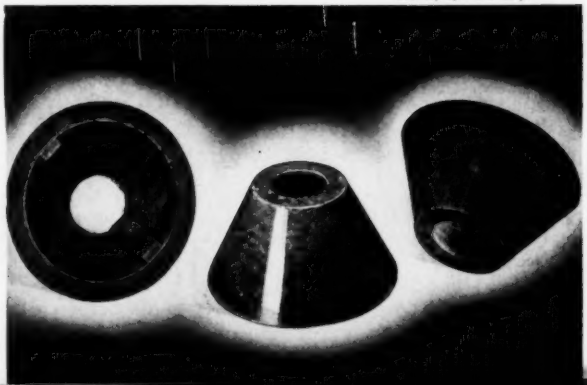
Laminated filter press plates and frame offer 40% higher filtering area and 50% greater flow rate than plates of other types

Courtesy Panelyte Div., St. Regis Paper Co.



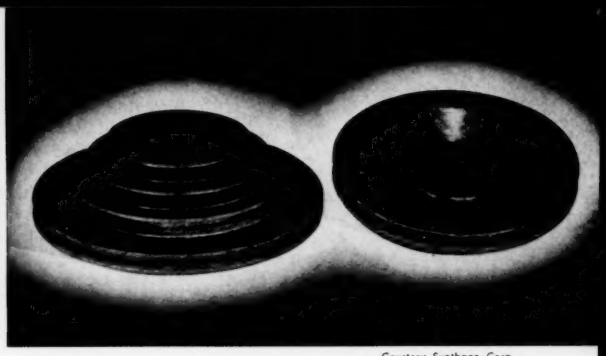
Molded-macerate clutch cones for lift trucks are molded to accurate dimensions to withstand high shock loads. Laminate cones prevent clutch slippage

Courtesy Synthane Corp.



Courtesy Taylor Fibre Co.

Grinding wheel bushings, made of laminate tubing cut to short lengths, need no costly finishing, eliminate scoring of arbor



Courtesy Synthane Corp.

Counter-shaft and motor pulleys for lathes, millers, and other tools are made from molded macerate stock. V-grooves are held to close tolerances

is increased by 50% over other types of plates. Since the laminate plates are made much thinner, more of them can be installed, if plant operating conditions warrant, in a given press than is the case with plates made from other materials. This provides 1) a greater filtering area, and 2) the possibility of reducing the number of industrial filter presses for specific jobs.

Plastic filter plates and frames used in one typical installation measure $43\frac{1}{4}$ by $45\frac{3}{8}$ by $\frac{7}{8}$ in. thick.

De-Icers

Plastic laminates also find use in de-icing systems used on airplane propellers. In one such use, two intricately shaped laminate parts are transfer molded from macerated fabric stock impregnated with a modified diallyl phthalate resin. The parts are used on propellers manufactured by Hamilton Standard, Hartford, Conn. Molded by The Formica Co., Cincinnati, Ohio, they require a minimum of fabricating operations. Most of the holes are molded-through, and certain inserts are molded-in. In production, preforms of the impregnated macerate stock are pressed, and high frequency preheating is used to soften the preforms before the transfer molding operation. The special laminating material was developed to resist wide temperature variations to which parts would be subjected.

Valves

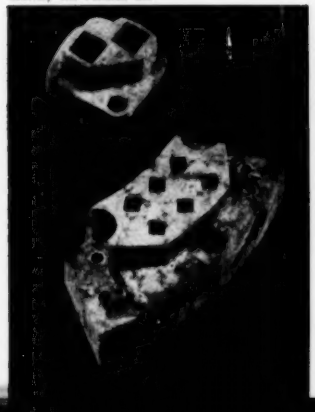
A special ball and seat for oil well valves are also being produced by Formica. These valves are used to control the flow of mud during oil well drilling operations. This mud is continuously pumped down through the oil well casing, in order to lubricate the drill points, and it is necessary that some type of check valve be used so that the mud will not back up through the casing. Many materials were tried, but the one which appears to be most satisfactory is a molded phenolic macerate. The ball itself is molded and then centerless ground to final dimension (4 in. in diameter) and finish.

The oil well valve seat is completely molded to final shape and dimension, the only finishing operation being that of removing the flash. All the working surfaces of this $7\frac{1}{2}$-in. diameter part, such as the ball seat and an external thread, are completely produced in the mold.

Formica also manufactures various sizes of laminate pump seal rings. Inasmuch as these rings are split (they are similar in construction to piston rings in internal combustion engines) they would normally be molded in a solid circle and then cut. However, Formica has devised an ingenious and economical method for making these rings. A continuous spiral of a phenolic impregnated fabric is laminated

De-icer pads for propellers are transfer molded of resin-impregnated macerate

Courtesy The Formica Co.



Among large laminate parts are wear-resistant, shock-absorbing slipper bearings for steel mills. Points (A), position of spindle coupling bearings; (B), roll neck bearings

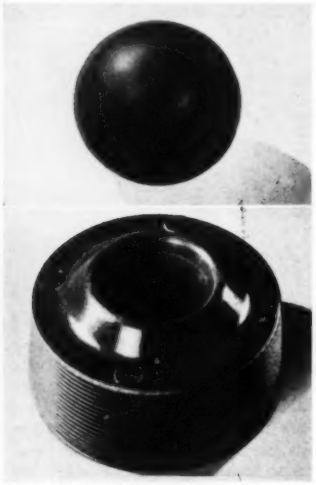
Courtesy Bakelite Co.

and then accurately cut into separate split rings.

Bearings

Some of the largest industrial laminate parts are produced by T. L. Gatke Corp., Chicago, Ill., in the form of different sizes and shapes of bearings. One special self-alining slipper bearing was developed especially for use on a steel blooming mill. Although this application of laminates is not new, it is of interest because of the severe service and tremendous shock loads which it must withstand. Phenolic fabric bearings are made up to sizes for 30-in. journals and in special cases even larger.

From the huge to the small in bearings: Synthane Corp., Oaks, Pa., has produced millions of tiny bushings for the rocker arms on automotive ignition distributors. In fact, the volume of this application is so large that the company has developed a special piece of equipment for making the small-diameter tubular stock from which these bearings are subsequently machined on automatic screw machines. In principle, this machine operates as follows: Several narrow rolls of phenolic impregnated paper are mounted on separate spindles and are fed to a combining and rolling mechanism which spiral-winds the several strips onto an accurately sized mandril. As the strips are continuously wound, they are forced through a special type of heated die mechanism, which compresses and cures the resulting tube. An automatic cut-off unit saws the continuous tubing into pre-determined lengths, each length being automatically conveyed to a storage bin. These lengths of tubing are later loaded in bulk onto the feed end of an automatic screw machine.



Courtesy The Formica Co.

Ball and seat made of phenolic macerate stock are used in oil well valves

Grinding Wheel Bushings

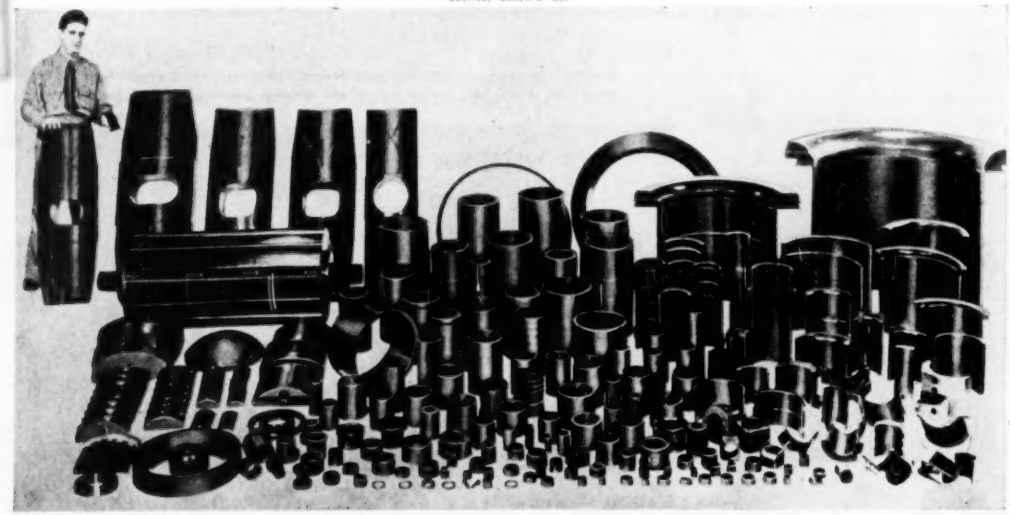
Taylor Fibre Co., Norristown, Pa., is a large producer of various sizes of thin-walled tubing, which when cut into short lengths is used as bushings for resinous type grinding wheels. The wall thickness of these bushings, laminated from a paper-base phenolic material, is generally $\frac{1}{16}$-inch. A fine thread is machined onto the outside of each bushing section, after which the section is used as an insert in the mold which produces the grinding wheel. A strong bond is obtained between the abrasive and the bushing during the curing cycle. These phenolic bushings have several advantages. They eliminate score marks and wearing of grinding wheel arbors. The inside diameter of the wheel, which is actually the outside diameter of the laminate bushing, is held to very close tolerances. By the use of these bushings, a costly finishing operation has been eliminated.

For Soup, Too

Taylor also produces a valve disk used by Campbell Soup Co. in its Sprague-Sells filling machines. These disks are compression molded from an odorless phenolic-canvas

Phenolic fabric bearings are molded to finished dimensions in all shapes and sizes from tiny bushings to parts for 30-in. journals. They are adaptable to steel mills where frequent reversing presents problems, or to conveyors where quiet operation is required

Courtesy Bakelite Co.



base laminate, which will withstand continuous temperatures over 200° F., which has good dimensional stability, and which exhibits almost no water absorption. These valve disks have one large center hole, about which they are rotated, and three holes spaced 120° apart and approximately half way between the center and the outside diameter. As the disk is indexed by cam action, the spout of the filling machine is opened when one of the holes is in position directly beneath it, and closed when the hole indexes beyond it. The smooth surface of this disk and its absolute flatness provides a perfect valve seal.

Pulleys

Counter-shaft stepped pulleys and motor pulleys used on Hardinge lathes, millers, and other tools, are produced from molded macerate material by Synthane. Certain of the surfaces of these pulleys are molded to final finish. However, accurate machining operations must be used to cut the grooves. For example, one large stepped pulley which has an outside diameter of 11¼ in. and is 2^{13}/$_{16}$ in. thick, has four grooves machined on it; each step must not exceed a run-out of 0.010 in. and the sides of the v-grooves must be held within a 0.005 in. total indicator reading.

Another molded macerate application produced by Synthane takes the form of a clutch cone used on industrial lift trucks. Since the surface of these cones transmits the entire power load and, further, since they must withstand terrific shock loads, they must be molded to accurate dimensions with a super finish on the surface. Because of the use of these laminate cones, no clutch slippage, which would develop excessive heat, is encountered; also, the great impact resistance of the material withstands the shock loads in this application.

Cost Reduction

Bakelite Co. has had under development for some time a program aiming at a marked cost reduction in the laminate molding of such items as toilet seats, doors, and table tops. The process makes use of a shell-type screened preform, the shape of which can be round, oval, rectangular, etc., according to the part to be molded. This preform, produced from a 50% phenolic resin pulp slurry, is dried in an oven to a predetermined volatile content. Loaded in a standard compression mold, the center is filled with a mixture of 90% ground wood waste and 10% phenolic resin; the whole is then molded under standard compression molding procedures. In the case of one item which had been produced by standard molded macerate procedures, a saving of more than 50% is indicated by the use of this new process.

Rogers Corp., Manchester, Conn., produces its laminate sheet material in a manner different from more standard procedures. The first step involves a thorough mixing of fibers and resin in a slurry, after which the impregnated fibers are made into sheets about 0.004 in. thick on an ordinary paper-making machine. These sheets (still wet) are then fed to a take-up roll, on which they are allowed to build up into the desired thickness before being removed. The built-up sheets are then laminated in a standard multiplaten press. Rogers claims that parts machined from this type of laminate can take self-tapping screws in directions perpendicular to the laminating pressure equally as well as directly parallel to it, simply because the resulting sheet is a homogeneous structure. The company has produced a specialty laminate which is so flexible that a 0.040-in. thick strip can be cold-wrapped around a 1-in. diameter mandril without breaking.

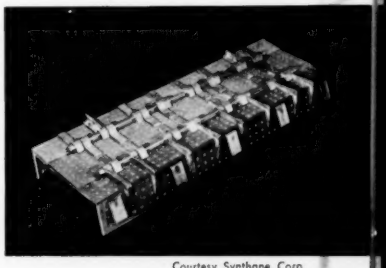
Laminate Molds

Although Synthane uses molds in many of its operations, one of its laminated products is itself a mold, used by Johns Manville to form lagging blocks of magnesia. These molds are fabricated from ½-in. stock and are 40 in. long, 13½ in. wide, and 4 in. deep. The two sides and a portion of the top of the mold are hinged so that after the lagging block has been formed, the movable sections of the mold can be opened and the block easily removed. A series of small holes is drilled in the top and the sides of the mold on multiple spindle drill presses.

In operation, the mold, in the form of a box with a round material entrance port at one end, is clamped in a hydraulic press. The magnesia paste, which consists of magnesia, water, and some asbestos fiber, is rammed into the mold through the hole. As the paste is forced in, excess water squirts out of the small drilled holes. After the mold has been filled completely and the ramming pressure has forced out all the excess water, the block is sufficiently rigid so that it will hold its shape when removed from the mold. The block is then baked.

Courtesy The Formica Co.

Post-formed laminated pump seal rings are first made in a spiral, then split



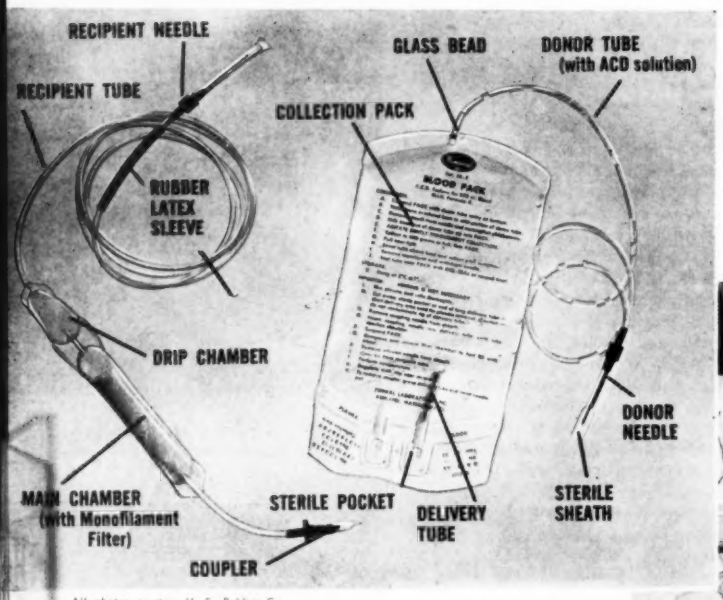
Courtesy Synthane Corp.

Heavy mold for magnesia blocks is produced from ½-in phenolic laminate

The Future

Such are some of the present-day laminate materials and some of their industrial applications. The whole story has not been told here; it would fill volumes. But the materials of today have proved properties; their applications show that they can meet the severest tests. The future of industrial laminates and their uses is truly unlimited, unless a limit is set by the limits of the engineers who work with the materials—or who should!

Vinyl



All photos courtesy U. S. Rubber Co.

Transfusion set has molded nylon needle hubs, nylon monofilament filter, phenolic coupler, rubber latex sleeve, glass bead. Rest of equipment is vinyl

For blood collection operation, the sterile donor needle is unsheathed and inserted in vein in anesthetized area of skin

VINYL blood packs and accessories with nylon and phenolic molded parts have been developed by Fenwal Laboratories, Inc., Ashland, Mass., after three years of research in collaboration with a large eastern hospital. The plastic blood transfusion equipment offers numerous advantages over the glass equipment now commonly used: 1) it substantially reduces the hazards of bacterial contamination; 2) it does not have the deteriorating effect that the smooth surface of glass is believed to have on blood; 3) it eliminates contact of air with the blood during collection and storage; 4) it is disposable after one use; 5) it effects substantial cost and space economies in packing and storage; and 6) it eliminates the danger of breakage in shipping.

The equipment consists of: a lancet for obtaining blood samples in the donor center; a vinyl collection bag to which the donor tube and needle is attached; a coupler which joins the collection bag and recipient tube during the transfusion; a recipient set which filters blood and regulates its flow; and a recipient tube and needle. Except for three small molded parts, the equipment is made of vinyl and is fabricated by electronic heat sealing.

The lancet is a stainless cutlery steel insert molded-in to a nylon handle by Victory Plastics Co., Hudson, Mass. Twelve lancets are packaged in a Durez phenolic case molded by W. M. Gulliksen Mfg. Co., Newton Lower Falls, Mass. The sterile lancets are held in individual tapered holes in the front half of the case. After use, they are dropped into racks in the rear compartment to prevent accidental reuse of unsterile lancets. After washing, the entire unit is resterilized by autoclaving.

The blood pack is fabricated and assembled by Fenwal from vinyl layflat tubing and intravenous tubing extruded by Irvington Varnish & Insulator Co., Irvington, N. J., using a special formulation based on Naugatuck Chemical Div.'s nontoxic Marvinol VR-10. Layflat tubing is also supplied by Plax Corp., Hartford, Conn. This tubing is made from a medical quality vinyl formulated by Bakelite. These vinyl materials are able to withstand the 250° F. heat necessary for sterilization because of their high molecular weight. Texturally, the extruded sheet and tubing approximate the inner surface of the human vein.

The 12-mil vinyl layflat tubing is heat-sealed electronically to form the 575-c.c. collection bag. Two vinyl delivery tubes are inserted perpendicular to the base of the bag, connecting the large area with two small pockets heat sealed in the base of the pack. A diaphragm is

Blood Packs

Flow of blood is regulated by knot in donor tube. The flexible collection pack, which is placed below donor's arm, distends as it fills with blood

After blood has been collected, donor tube is sealed hermetically at juncture of tube and pack by high frequency sealer

sealed in each tube to prevent the blood flow into the sterile pockets.

A length of 0.124-in. i.d intravenous tubing is sealed into an opening at the top of the pack. Because this donor tube, and the needle attached to it, is attached directly to the blood collection bag and sterilized as one unit, there is no need to couple them together at the time of collection with the consequent danger of contamination.

The stainless steel donor needle is specially flared in a nylon hub to permit unobstructed flow of blood. The nylon hub, which fits tightly into the donor tube, is injection molded by Nylon Bearings Co., Whitman, Mass. A sterile vinyl sheath grips and seals the exposed portion of the needle. When the needles are sold separately, twelve

Before infusion, recipient set is joined to collection pack by coupler which pierces sterile pocket and diaphragm in delivery tube to establish a sterile blood circuit

To administer blood, collection pack is elevated; blood flows through the recipient set where it is filtered. The rate of flow is observed and regulated in the drip chamber

needles are packaged in a polystyrene case molded by Victory.

To prevent the blood from coagulating during collection and in storage, 75 c.c. of ACD—containing citric acid, sodium citrate, and dextrose—are put in the donor's tube. A hemo-repellent bead in the juncture of the donor tube and the bag prevents air from entering the donor tube when the needle cover is removed. After the donor needle is inserted in the vein, the bead is squeezed out of the donor tube to permit the flow of blood.

When the pack has been filled with blood, it is hermetically closed by sealing the base of the donor tube with a portable dielectric sealer. In addition, the donor tube itself can be sealed in four or five places, trapping pilot samples of blood which are used for cross matching with the patient's blood at the time of transfusion. When stored at 4° C., the pack of collected blood is safe for infusion for a period of 25 days.

Directions for use of the blood pack are printed on the vinyl collection pack. The symbols for various blood types are also printed on the pack below the heat seal which forms the bottom of the collection area. The type of blood in the bag is indicated by punching the proper symbol. The date of collection is recorded in the same manner.

When a transfusion is being set up, the blood pack is hung at an elevation with the delivery tubes at the bottom, and one of the sterile pockets in the base of the pack is cut away with scissors to expose the delivery tube (the other is an auxiliary channel sometimes used for plasma removal). The piercing end of the coupler which is attached to the recipient set is twisted into the delivery tube, piercing the diaphragm. The coupler, transfer molded of a Durez phenolic by Gulliksen, maintains a sterile circuit from the blood pack to the recipient tube and set.

During the transfusion, the blood leaves the collection pack through the vinyl delivery tube, which is perforated to remove gross matter, and passes through the recipient tube to the recipient set—a transparent barrel of 32-mil semi-rigid vinyl. The barrel, a Bakelite formulation extruded by Plax, is heat sealed at one point by Fenwal to divide it into two chambers. The main chamber contains a 100-mesh nylon monofilament filter; the other section is a drip chamber where the rate of drip is observed and the rate of infusion controlled. The blood passes through the drip chamber directly into vinyl tubing and the intravenous needle. A rubber latex sleeve autoclaved over the end of the tubing permits additional medication to be injected through the tube; the latex closes the puncture.

Another type of blood pack made by Fenwal is the Ion Exchange Blood Pack, used principally for research and experimentation when blood is needed without anti-coagulant solution. As the blood is collected, it passes through a column of ion exchange resin (Dow Chemical Co.'s Dowex-50) which removes calcium, the natural clotting agent in human blood, and then into the vinyl pack. After the pack has been heat sealed, the supports leading to the ion exchange column are cut and the container stored in the same manner as the ACD Blood Pack. If this blood is used for massive transfusions, the calcium may be replaced artificially to restore the clotting properties of the blood.

Military use of the newly developed vinyl blood pack is expected to be great, taking advantage of its one-use disposable feature and ease and safety in shipping to field and base hospitals. The ACD Blood Packs, packed four to a vapor-proof container, can withstand temperatures from -70 to 170° F. in storage without damage. The packs of whole blood can be stored or transported in refrigerated containers without protective padding and with no danger of breakage.

Nylon-handled lancets for getting blood samples are stored in a phenolic case

A Telephone That's Tough

Molded nylon housing can even stand immersion in salt water or being dragged behind a vehicle over rough roads

USE of molded semi-rigid nylon in a telephone handset designed expressly for an LVT (Landing Vehicle Tracked) resulted in a unit of compact construction and remarkable durability. This instrument, which is used for communications between the crew of the vehicle and the supporting troops, is connected to the LVT by a 25-ft. length of cord. This communication wire feeds from a reel which automatically winds up when the instrument is not in use.

The rugged service for which these tank handsets are intended is indicated by the following specifications: 1) the microphone must withstand temperatures of -60 to 75° C. and immersion in salt water for extended periods; 2) it must withstand being dropped 12 times at random orientation from a height of 10 ft. to a concrete floor; 3) it must be dragged by the cord behind a vehicle at 25 mph. over an average type dirt road for one mile; 4) it must be able to take exposure to a relative humidity of at least 90% at a temperature of 50° C. for 100 hours. All of the above tests must be passed without any alteration in operation of the telephone.

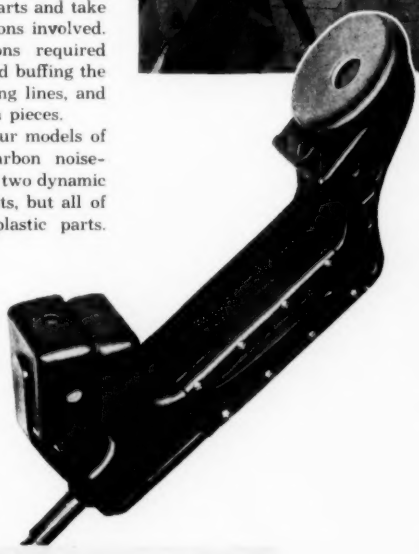
Development of the nylon tank telephone handset which passes all these tests was carried out by the Electronics Div. of the Navy's Bureau of Ships, and engineers of Electro-Voice, Inc., Buchanan, Mich. G. Felsenthal & Sons, Inc., Chicago, Ill., molds the nylon parts; final assembly of the instrument is done by Electro-Voice.

The handset has four black nylon parts: the housing, the push-to-talk switch and its bezel, and a bottom plate. These parts are injection molded of FM-3001 semi-rigid material. They weigh about 16 oz., including the sprue, and are produced in a combination mold on a 22-oz. Impco press equipped with a nozzle screen pack.

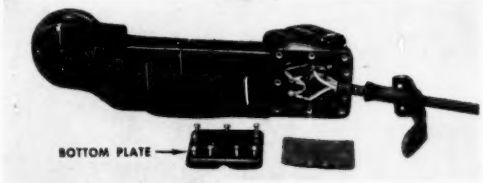
In order to accommodate the various assembly screws and electrical connections, the main body of the unit contains 25 molded-in brass inserts on three different planes. Because of the intricate coring required, side cores must be pulled in three directions before the mold opens. One of these cores is operated by the traveling action of the cylinder; the other two are actuated by a rack and pinion arrangement.

A molding cycle of 4 min. is required in order to eliminate sink marks in the finished parts and take care of the heavy sections involved. The finishing operations required consist of machining and buffing the gates, buffing the parting lines, and sand-blasting the nylon pieces.

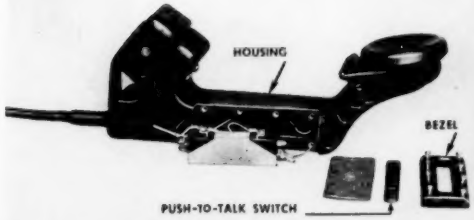
There are actually four models of the telephone, two carbon noise-cancelling handsets and two dynamic noise-cancelling handsets, but all of them use the same plastic parts.



Telephone handset is attached to LVT by 25-ft. cord, and is used for communications between the supporting troops and vehicle crew



Photos courtesy Electro-Voice, Inc.



Four parts of handset labelled in photos above and right are molded of nylon. Intricate coring is needed in large housing, which has 25 molded-in brass inserts

Dresser sets have back decorations printed in full color on Polyflex styrene sheet. This increases the beauty and sales appeal of the sets and makes it possible to change designs without changing molds. Three different types of sets are available. All parts of the dresser sets except the mirror and the bristles are injection molded of styrene. The bristles are extruded of styrene. Plax Corp., Hartford, Conn., supplies the styrene sheet material. Standard Pyroxoloid Corp., Leominster, Mass., manufactures the dresser sets

PLASTICS

Cast for the re-creation of the Nativity scene is molded of Tenite I cellulose acetate. The 20-piece set includes Mary, Joseph, the infant Jesus, shepherds, animals, and an angel, all decorated in color. Made by Hartland Plastics, Inc., Hartland, Wis.

ll with changeable moods has three faces molded of Vinylite plastisol resin. Two of the faces are hidden by the doll's head. Thus the doll's expression can be changed to crying, laughing, or sleeping by turning the head so as to bring the proper face to the front. The doll is 16 in. tall, is made by Ideal Toy Corp., 200 Fifth Ave., New York, N. Y.

Spiral screwdriver has transparent Tenite II cellulose acetate butyrate handle. Points stored in the handle are always visible. Handle is molded by A. L. Hyde, Grenloch, N.J., for North Bros. Mfg. Co., Div. of Stanley Tools, Lehigh Ave. & American St., Philadelphia 33, Pa.

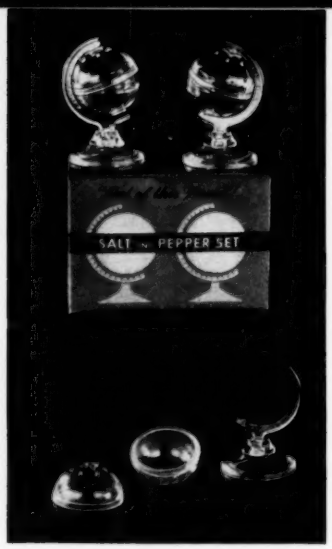
House plants can be irrigated and fertilized easily with a styrene irrigator which can easily be pushed into the ground next to the plant. Water or fertilizer is poured into the flared top of the device and is transmitted to the roots through holes in the side, and the soil does not get a hard surface. Irrigator is produced by Soilaire Industries, 1200 2nd Ave. S., Minneapolis, Minn.

PRODUCTS

Ribless umbrella is made of vinyl-coated paper, is colorful and light enough to be used as a parasol. It is pleated, and the pleats take the place of ribs. The umbrella, called the Rainbelle, is lighter than umbrellas of conventional construction and costs much less. It is made in two sizes by Folding Products Mfg. Corp., 21-09 Borden Avenue, Long Island City 1, N. Y.

Clamp-on cord switch molded of urea and phenolic can be attached anywhere on an electric cord in a matter of seconds. Only one side of the cord has to be cut, and no insulation need be removed. The clamp switch is manufactured by Gilbert Mfg. Co., Inc., 24-20 46th St., Long Island City 3, N. Y.

Flute molded of styrene has eight molded styrene reeds built into the body, one for each hole. The flute thus sounds like a harmonica. Made by Magnus Harmonica Corp., 439 Frelinghuysen Ave., Newark 5, N. J.

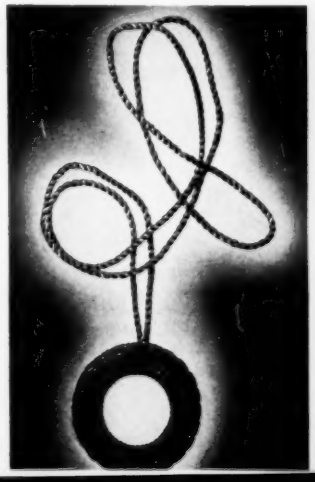


Salt and pepper shakers $2\frac{3}{8}$ in. high look like miniature globes. They are molded of transparent styrene in two halves and can be taken apart for easy filling. Made by Dart Craftsman Corp., 240 Madison Ave., New York 16, N. Y.

PLASTICS

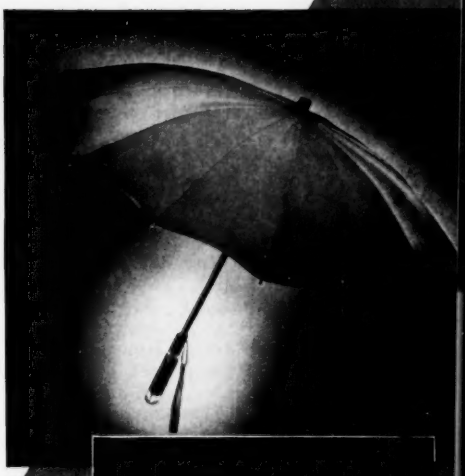
oy Rogers raincoat is made of moke gray 4-gage vinyl film and as yellow collar, cuffs, and ocket welting. The western motif is carried out by the decorative tions around each snap fastener; gold-colored metal gun is riveted to a yellow holster-shaped piece of vinyl. All seams in the coat are electronically sealed. Manufactured by S. Bachenheimer & Co., 1737 S. Michigan, Chicago 16, Ill.

Washable, rustproof window shade pull is molded of cellulose acetate, and has a standard length of rayon cord molded-in. The washable pull looks like a crocheted one. Made by Synthetic Plastics Sales Co., 461 8th Ave., New York



Swim trainer made of 20-gage clear vinyl film supports the body without hindering arm movement as do water wings. The inflated trainer, called the Kik-O-Pul, straps on the back and supports the body even if the swimmer does not move. By Plastic Sheeting Co., 931 S.E. 6th Ave., Portland 14, Ore.

Realistic machine gun 6 in. long fires $\frac{1}{8}$-in. pellets in rapid succession as the crank is turned, and chatters like a real gun. Both the gun and the pellets are made of styrene. The gun takes 18 pellets at a loading. It is harmless but "bullets" can knock over paper targets. Made by Gladen Enterprises, Inc., Bay City, Mich.



PRODUCTS

Sturdy one-piece case for a first aid kit is molded of Bakelite polyethylene and has a hinge molded as an integral part of it. The case is non-corrosive, moisture-resistant, and will not rattle around in the glove compartment of a car as will a metal case. It has a snap closure. Molded by Auburn Button Works, Inc., Auburn, N. Y., for Johnson & Johnson, New Brunswick, N. J.

Cast phenol[ic] [han]dle has [a] built-in flashl[ight] with an acrylic lens. The light can be [turn]ed on and off with a simple twist of a ring at the top of the handle. The light can be used to find key-holes, door [knobs], dark [spots] or puddles. The umbrella, called the Umbrellite, is available [with] 18 or 20 ribs. It is made by Ruth [Cooper] Associates, 100 W. 88th, New [York] 24, N. Y.

Curing RF Heater Television Interference

by P. S. RAND, J. J. LAMB, and A. J. RILEY†

The new F.C.C. rules and regulations relating to the operation of industrial radio frequency heating equipment become effective June 30, 1952. It is probable that the majority of such equipment used by the plastics industry—HF pre-heaters and heat sealers—in operation today will *not* meet the new F.C.C. regulations in one way or another. This article explains the problem in simple language, and clearly outlines a practical, low-cost way for molders and heat sealers to operate their equipment in accordance with the new law, either within or outside the assigned frequency bands.

RADIO frequency heating equipment used in the plastics industry can cause serious interference (Fig. 1 and 2) with television and other services in the very high frequency radio spectrum, unless adequate steps are taken to prevent the equipment from assuming a secondary role as a broadcasting station. So wide-spread is the problem—it involves not only T.V. but also other commercial radio services such as airport control, aircraft navigation, police, fire department, FM broadcasting, etc.—that the Federal Communication Commission has been prompted to enforce more vigorously the Federal Government requirements concerning the operation of such industrial electronic heating units in accordance with provisions of Part 18 of the FCC rules and regulations.

The purpose of this article is to acquaint industrial plant personnel with the basic problem and to show how such interference can be eliminated economically. Such a procedure is desirable to comply with the letter and spirit of the FCC regulations and also to promote community good will.

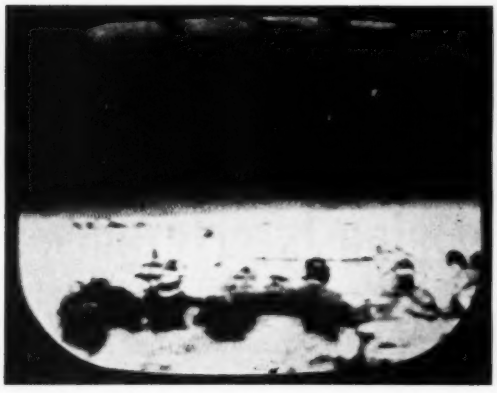
Generators are Transmitters

Radio frequency generators used for preheating plastics preforms and heat-sealing plastics film and sheet have as a source of energy a radio transmitting tube oscillating at some frequency in the radio spectrum and operating with power inputs of from several watts to over 50 kw. These oscillators generate a fundamental frequency plus a number of harmonics or multiples of the fundamental. These harmonics are the basic source of interference to television. The problem is that of confining the radiated and conducted radio power and thereby preventing this power from causing interference.

If a radio frequency generating device is completely shielded, and if all wires leaving the shielded enclosure are effectively filtered, no appreciable power will be radiated to cause interference. While it is common practice to confine commercial RF generator circuits in metal containers which would seem to provide adequate shielding, these containers do not prevent radiation for a number of reasons. The enclosures for preheaters and similar equipment generally present heat dissipation problems; ventilating

* Reg. U.S. Pat. Office
† Laboratory of Advanced Research, Remington Rand, Inc., South Norwalk, Conn.

Searching for unsuppressed harmonics, the authors conduct field strength measurements with mobile equipment 80 ft. from possible source of trouble—a battery of preheaters



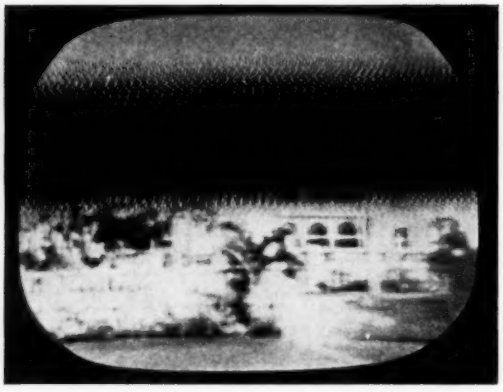


Fig. 1 (left) and Fig. 2 (right) show two types of T.V. interference caused by harmonics from preheaters. Disturbance usually consists of one or two dark bands, moving up or down and made up of wiggly, zig-zagging lines. Interference lasts for cycle of the heaters

holes of $\frac{1}{2}$ to 1 in. diameter are therefore drilled in the cabinets to permit air circulation. In addition, panel-type construction and grills for observation are usually provided. The result, in most cases, is that the equipment containers are ineffective as electro-magnetic and electro-static shields. Even a wire only a few feet in length used as a power lead in a piece of preheating equipment can act as a transmitting antenna for harmonic RF currents; even the metal enclosures themselves can resonate at T.V. frequencies and form a transmitting antenna. The problem, then, becomes one of rendering these potential antennas ineffective. But to understand fully the solutions given below, it is first desirable to scan a few basic principles. Thus it must be remembered, for example, that a preheating unit operating on a fundamental frequency of 26 mc. generates a third harmonic on 78 mc., a seventh harmonic on 182 mc., an eighth harmonic on 208 mc., etc. Table I shows that such a unit could generate a signal capable of interfering with T.V. reception on Channel 5 with the 3rd harmonic, 78 mc.; on Channel 8 with the 7th harmonic, 182 mc.; and on Channel 12 with the 8th harmonic, 208 mc.

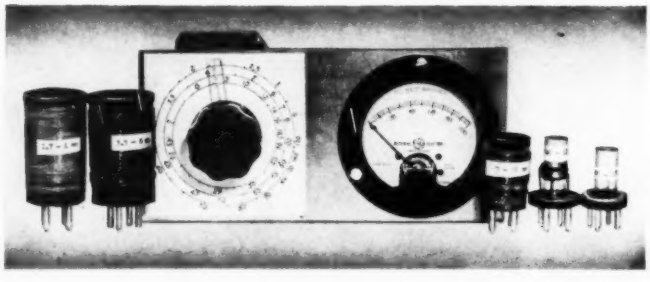
"Sky-Wave" Signals

This type of interference is caused by what is known as the "groundwave" signal, which falls off rapidly in strength and usually is not bothersome beyond several miles from the offending plant. An additional source of interference is caused by what is known as a "sky-wave" signal. This signal, inseparately associated with every ground-wave signal, is capable of transmission with very little attenuation for thousands of miles, depending on power, frequency, time of day, time of year, efficiency of radiating antenna (which may be an overhead water pipe or unshielded power line), and other conditions. This sky-wave signal is that part of the combined radio signal that enables you to hear more distant broadcast programs at night. This sky-wave signal also makes it possible for improperly shielded industrial heaters to cause serious radio interference literally all over the world. The FCC reports reception of signals from this type of equipment in the New York City area which it believes originated in Europe and California. The FCC, by court order, recently closed a plastics plant in the New York area that was causing serious radio interference to the U. S. Coast Guard thousands of miles away. In this case it was the sky-wave signal from the

Table I—Television Channel Frequencies (Present IF Frequencies, 20 to 40 mc.)

T.V. channel	*Operating bandwidths*
	mc.
2	54-60
3	60-66
4	66-72
5	76-82
6	82-88
7	174-180
8	180-186
9	186-192
10	192-198
11	198-204
12	204-210
13	210-216

Fig. 3—Wavemeter for locating RF leaks. It is equipped with a crystal diode detector, a 0-100 microammeter, and a set of plug-in coils. Control knob of condenser is at left



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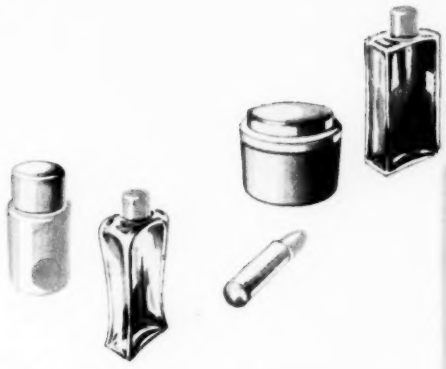

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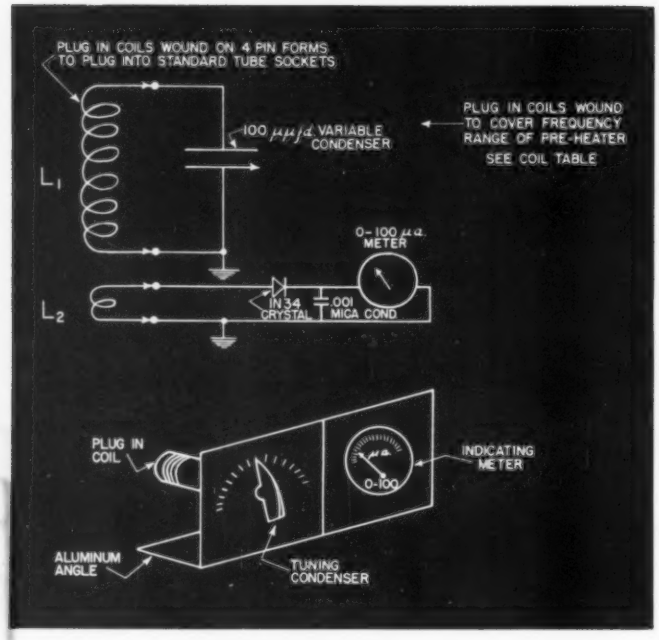


Fig. 4—Circuit diagram of crystal diode wavemeter. Frequency range with seven plug-in coils is from 650 kc. to 170 mc. Larger coils can be wound to extend this range

Fig. 5—Rear view of preheater before treatment, showing ventilation grillwork, holes, joints, and cracks from which RF leaked out to produce television interference. Preliminary investigation of offending equipment revealed greatest radiation from a 2-in. diameter hole in the far side of the cabinet through which blower nose passed

17th harmonic of two 12-kw., 200 kc. heating units that was causing the interference, and not the 200-kc. fundamental signal. This type of interference is covered by Part 18.24 of the FCC rules. It is far more serious than interference in the immediate area of the plant and is also much more difficult to locate.

The procedure for eliminating interference can best be illustrated by recounting the work of the authors on a typical interfering installation. The high frequency oscillators in this setup were used to preheat plastic preforms in the production of electric shaver cases at the Remington Rand Shaver plant in Bridgeport, Conn.

The reason for attacking the problem was two-fold: First, a few constant complaints by T.V. viewers in the vicinity of the plant; second, to eliminate the probable necessity of having to purchase 10 new preheaters that would meet the particular FCC regulations effective June 30, 1952. These "Rules and Regulations (Title 47—Telecommunications—Chapter I) Part 18," relate to the operation of industrial RF heating equipment.

Leak Locater

As has been indicated, RF escapes through holes, cracks, joints, and vents in equipment containers and also radiates from unfiltered power leads and the like. A working tool is necessary for locating these RF leaks, and one of the simplest and most useful is an absorption-type wavemeter. Neon bulbs, glow lamps, and other such RF indicating devices are completely unsatisfactory, as their sensitivity is in the level of volts, whereas radiation levels measured in microvolts produce severe interference.

A satisfactory wavemeter equipped with a crystal diode detector and a 0-100 microammeter is shown in Fig. 3, along with its plug-in coils. The circuit diagram is shown in Fig. 4, and data on coils in Table II. If a wavemeter is constructed following the details given, the frequency range will be from 650 kc. to 170 mc. Larger coils can be wound if necessary to extend the range of this instrument to still lower frequencies. The length of the leads between the coil socket and the variable condenser must be kept to the minimum possible if the meter is to work above 100 mc. The dial on the condenser should be calibrated in frequency for each coil by picking up known RF signals from a grid dip oscillator or a signal generator. (A neighborhood

Table II—Coil Winding Table

Coil No.	*Frequency range*	*No. of turns L 1*	*Wire size*	*Diameter of coil*	*Length of coil*	*No. of turns L 2*
	mc.			*in.*	*in.*	
1	60-170	¾	#18 En.	½	—	1
2	40-110	2	#18 En.	½	1/16	2
3	19-55	4	#18 En.	1	¼	2
4	7-19	15	#18 En.	1	⅝	3
5	3.5-8	30	#18 En.	1⅜	1¼	4
6	1.7-4	75	#24 En.	1⅜	1⅝	6
7	0.650-1.7	170	#32 En.	1⅜	1½	10

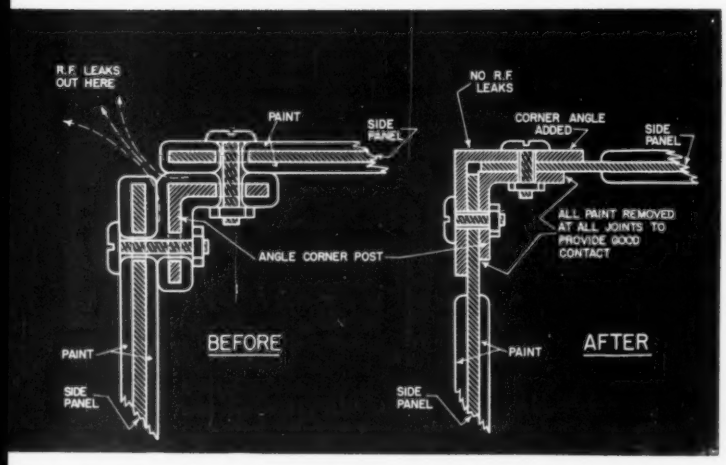


Fig. 6—Escape path for RF in heater cabinet (left) is blocked (right) by adding outside corner angle to cover cracks between panels and inside angle, and by removing paint

radio amateur or T.V. service man should be helpful on this.)

Locating Leaks

In using an instrument of this type it is only necessary to put in the proper coil and, with the dial tuned to the approximate frequency of the machine, to explore the AC line and the area around any breaks in the shielding. Carefully tune the condenser until a maximum reading is obtained on the 0-100 microammeter. Do not get too close to the electronic heater or you may burn out the meter. If the reading goes off scale, back away a bit until you get about a ¾ scale reading. The higher the meter reading the more RF is leaking out.

If the preheater is satisfactorily shielded, you should not be able to get any reading at all, no matter how close you come to the equipment with the wavemeter.

The sensitivity of the wavemeter described is such that a full-scale reading was obtained 2 ft. away from a 2-kw. preheater with one side panel removed as in Condition 1, Table III. With the preheater cabinet in its original condition, Condition 2, Table III, a full scale reading could be obtained within 6 in. of any of the cracks or holes in the dust cover. With the improved shielding of Condition 3, Table III, readings could be obtained only in the vicinity of the AC line cord and the hole through which it came out of the cabinet. Condition 5, Table III, showed no meter readings, no matter how close the wavemeter

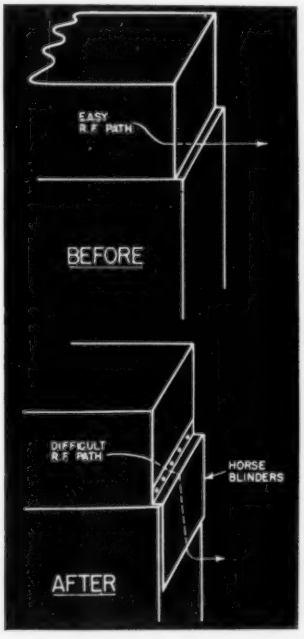
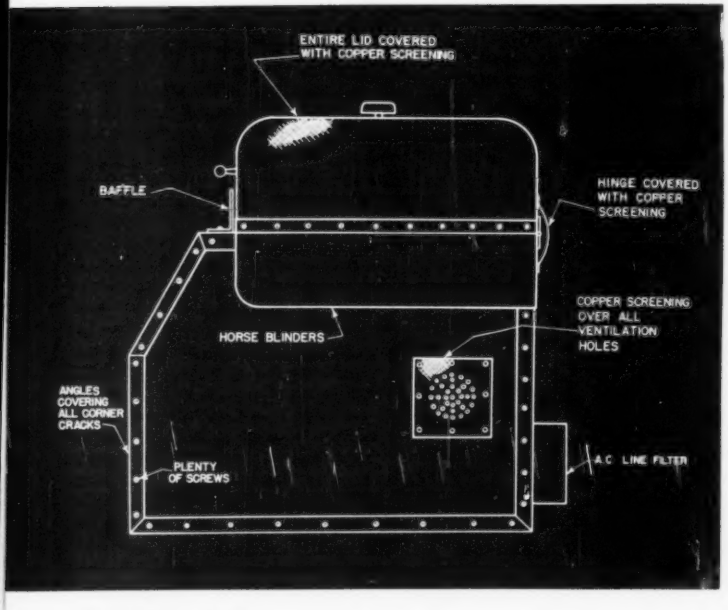


Fig. 8—Attachment of horse blinders (bottom) makes RF path more difficult

Fig. 7—Leakage of RF from cover of preheater cabinet is prevented by covering ventilating holes and grills with copper screening, adding baffle in front and blinders on sides



was coupled to the preheater cabinet or AC line.

The first step in the authors' trouble-shooting job was to visit several T.V. receivers in the neighborhood to observe the type and intensity of the interference. Fig. 1 and 2 show the general interference on nearly all channels most of the time. However, it was determined that the T.V.I. (television interference) was much worse on the street carrying the main power lines to the factory than on the other streets in the area, indicating that these power lines were carrying most of the interfering signal. AC line filters on the T.V. sets had no effect on the interference, indicating that the RF was being received via the T.V. antenna by re-radiation from the power lines as well as by radiation direct from the oscillator as a result of inadequate shielding. A standard type of high pass filter on the T.V. antenna helped some on some of the channels, which proved that the T.V.I. was partly caused by 21 to 26 mc. fundamental signals feeding directly through the T.V. front and into the video IF and partly by harmonics from the preheater oscillators.

Table III—Interference Field Strength From Preheater Measured at a Distance of 10 Feet

Degree of shielding	*AC filter*	*26 mc.*	*52 mc.*
		uv/m	*uv/m*
1. Side panel of cabinet removed	A	115,000	462
2. Original cabinet with painted joints	A	38,500	—
3. Improved shielding as described with "horse blinders" etc.	none	22,300	—
4. Same as 3	A	1,700	—
5. Same as 3	B	920	35

Fig. 9—Heater with cover open, showing how baffle and blinders are affixed

Localizing Troubles

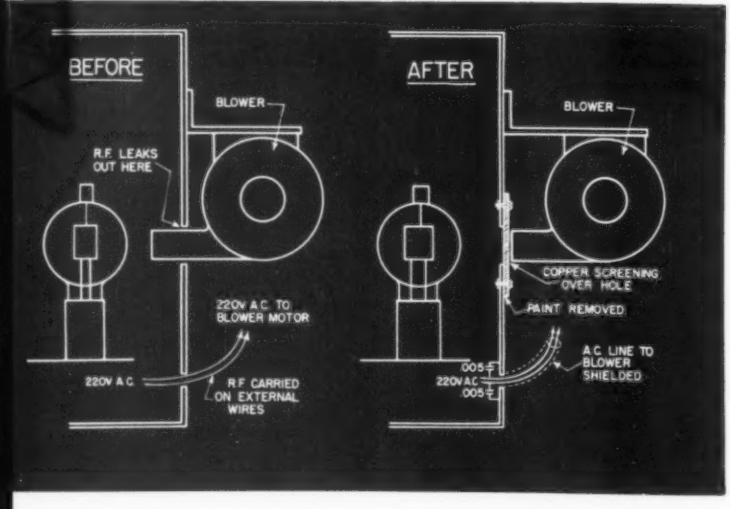
The next step in the search was to shut down the production line and run each preheater separately while observing which channels were interfered with and simultaneously measuring the field strength of the fundamental and the stronger harmonics with a calibrated field-strength measuring set. Each preheater was assigned a number for future reference and all data were tabulated (Table IV) against this number. During this test it was found necessary to place in each unit the usual number of plastic preforms so that the oscillator would be loaded up to rated plate current.

It was determined at this time that the frequencies of the 10 units varied from 25 to 35 mc. and that each unit drifted as much as several megacycles in frequency as the plastic preforms heated up.

Note in Table IV that the harmonic signal strength bears no definite ratio to the fundamental signal strength at the receiver. The table shows the field strengths of the lower frequency T.V. stations measured on a standard dipole antenna compared to the effective T.V. field strength delivered by the T.V. beam to the 300-ohm T.V. receiver input circuit. All the above measurements were made in a private home located about 150 ft. from the preheaters and about 25 ft. from the power line feeding the plant.

Preheater No. 5, one of the worst offenders, was selected for treatment. RF was measured radiating from all the cracks and joints in the cabinet (Fig. 5) as well as from the ventilation holes. It was especially bad where the nose of the blower protruded about an inch inside the cabinet through a 2-in. diameter hole. Removal of the side panels disclosed that the "dust cover" was assembled over an aluminum angle frame which had been thoroughly painted. The side panels also had been painted on both sides, and any metallic contact between the two

Fig. 10—Radiation from blower hole and AC line (left) was stopped (right) by mounting blower so hole could be covered with screening and by shielding and by-passing line



was purely accidental. The sides were screwed on with only a few screws, and there were cracks up to 1/16 in. wide in many places.

Figure 6 shows a top view of one of the corners of the cabinet. Notice how the panels are held away from the corner angle by the two thicknesses of paint and how the bolts are also insulated from both by the paint. Figure 6 also shows how this situation was effectively corrected,

Table IV—Interference Voltage From Preheaters Delivered to T.V. Receiver by T.V. Antenna 150 ft. From Preheater

Mach. No.	*Fund. freq.*	*uv*	*Harmonic*	*uv*
	mc.		*mc.*	
1	25.2	600	50.4	350
2	31.5	920	63.0	450
3	35.0	780	70.0	240
4	32.0	255	64.0	550
5	26.5	840	53.0	410
6	26.0	180	52.0	108
7	25.8	360	51.6	180
8	26.1	600	52.2	325
9	25.5	480	51.0	210
10	35.0	240	70.0	196

first by removing the paint and second by adding an angle outside the corner to cover the cracks between the panels and the corner angle. Two to three times as many screws were added to insure good electrical bonding.

Next step was to cover all ventilating holes and open grill work with copper screening, being sure to provide at least a 2-in. overlap, and to attach the screening with sufficient screws to insure good metal-to-metal contact. Further, all paint was removed from the contacting areas. All copper screening was soldered along the edges to provide good bonding for all of the wires as well as to prevent ravelling.

"Horse Blinders"

The problem of preventing RF leaks around a top cover which must be opened and closed during each cycle of operation of the machine was finally solved by covering the hinge on the rear with screening, Fig. 7; attaching "horse blinders" to the sides, Fig. 8 and 9; and placing a baffle in the front, Fig. 7 and 9. The "blinders" are attached to the cover and move up and down with it, while the baffle is attached to the machine and is stationary.

Radiation from the blower nose was corrected easily by mounting the blower so that the hole could be covered with copper screening as shown in Fig. 10, and by shielding and by-passing the AC line feeding the blower.

The last remaining detail was to

Fig. 11—AC line filter (cover removed to show placement of coils and condensers) designed to eliminate RF leakage

design and install an AC line filter to block the last remaining path by which RF of any frequency could leave the cabinet. What finally evolved is shown in Fig. 11, with the method of installation shown in Fig. 12. A short shielded AC line was attached which plugs into the conduit at the side of the press.

With the completion of shielding and filtering, a preliminary wavemeter check was made, and the results tabulated as in Table V. The T.V. receivers of the complainants were observed while No. 5 preheater was cycled, and no trace of interference was present.

This concrete experience definitely proves the point that shielding by itself is not enough to prevent interference radiation, and that filtering by itself is inadequate unless backed up by good shielding.

Shielded Rooms

All RF heating units (Fig. 13, for example) do not lend themselves as readily to shielding as those described, and in many cases must be placed in a shielded room if interference to radio services is to be eliminated.

A wooden framework covered with copper screening is technically a screened enclosure and will indeed keep out mosquitoes and flies; however, it will not keep radiations

(*Continued on p. 110*)

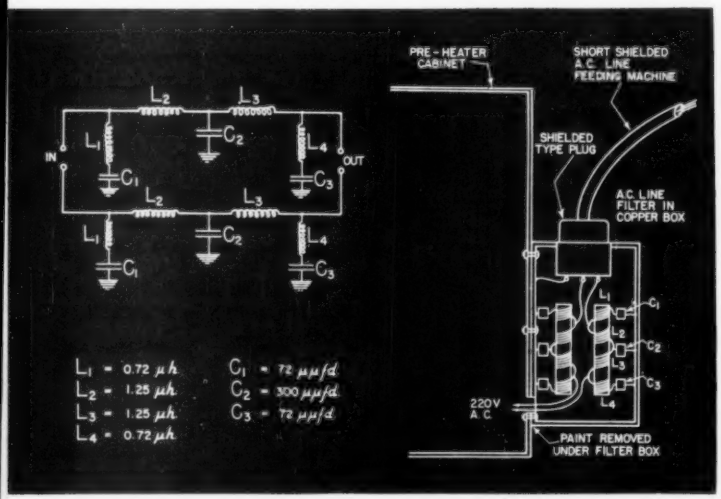
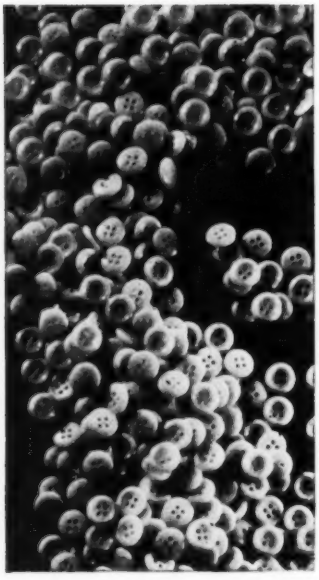


Fig. 12—Circuit of AC line filter and method of installation. Paint was removed from cabinet to insure contact and shielded AC line was plugged into conduit near machine.



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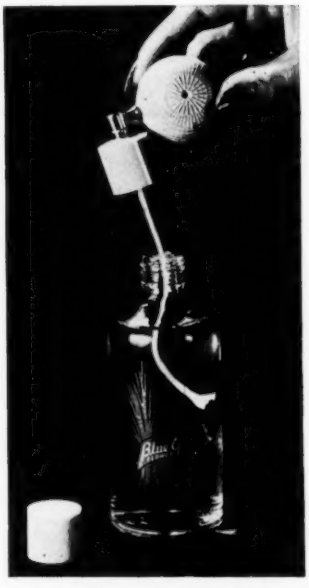

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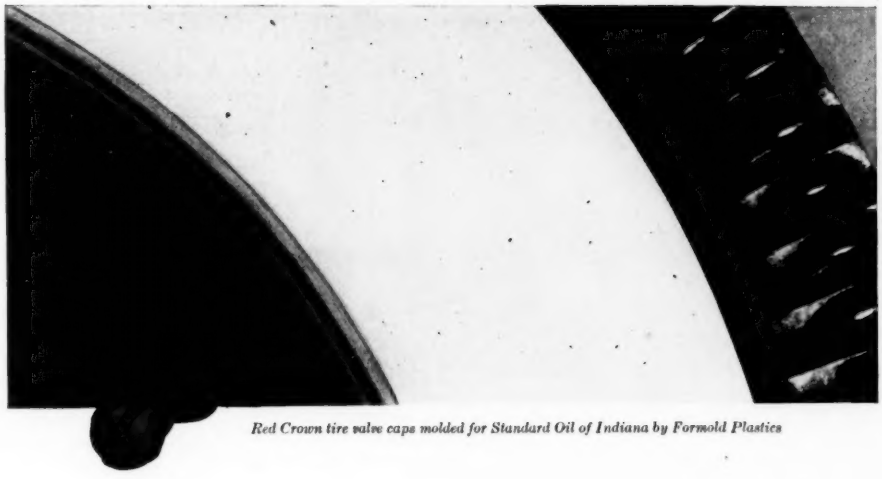

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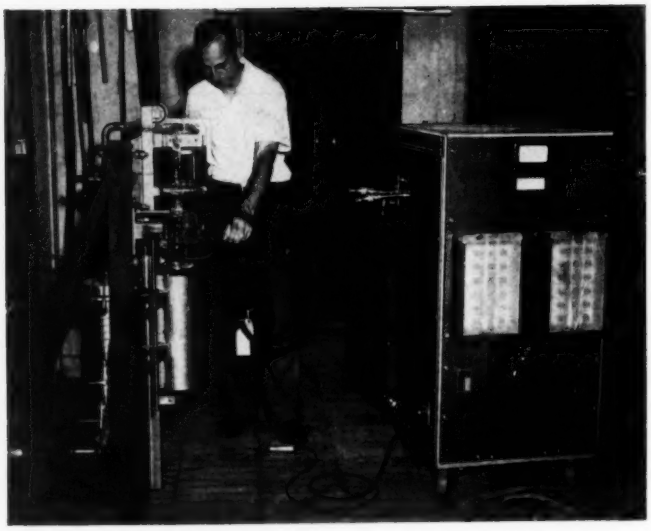


Fig. 13—Spark-gap heater housed in Masonite cabinet is completely unshielded. Radio interference from such equipment is best prevented by installation in a shielded room

from some industrial electronic apparatus from leaking out and interfering with radio services unless it is constructed with certain principles in mind. Figures 14 and 15 show the wrong and right ways. In Fig. 14, note that the screened room has been built around the overhead pipes and conduit to save the expense of raising the pipes or moving the electronic apparatus to a better location. Note also that long extension cords or drop cords have been run from convenient outlets to provide 110-v. AC for lights, fans, and similar equipment.

Little or no attenuation of radio interference can be expected from an enclosure of this type. Each of the pipes, conduits, wires, or other metal objects such as structural girders passing through the screened area will have part of the radio interference induced into it and in turn will conduct this interference outside of the screened area where the interference will be radiated into space as though from an antenna. Do not be fooled into thinking that an overhead water pipe is necessarily a ground and cannot radiate. It is only at ground potential for DC and AC voltages. For example, at 28 mc. it will change from a good ground to a high voltage point every *eight* feet. In other words, it will have standing waves on it and will radiate in just the same manner as would a long wire antenna.

Figure 15 shows the preferred method of constructing a screened room. Note that two layers of copper screening are used, one on the inside of the wood framework and one on the outside. Top, sides, and floor are covered in this fashion. All metal objects such as pipes enter at one point only, and each is bonded thoroughly to the screening both inside and out. All electrical wiring is fed via conduit to a shielded line filter at this same point. All joints in the copper screening are overlapped at least 4 in., and even the screen door is bonded along all four edges when closed. In this way virtually all radio frequency energy is kept on the inside of the inner screening, and any slight leaks are caught by the second layer of screening. If work must be carried into the enclosure by a conveyor belt, this belt should be enclosed in a long shielded tunnel leading to as small an opening in the shielded room as possible, with some kind of a metallic flap over the entrance. The belt should be of a non-metallic material.

Periodic Inspection Needed

After electronic heating equipment has been converted to meet the FCC regulations, it must be periodically inspected to be sure that it continues to meet these regulations. The best way to do this is to establish a definite routine for the plant maintenance department to follow. Each heater should be carefully checked for RF leaks with the crystal diode wavemeter at least once a week. At other times—for example, after a machine has been taken apart for repairs—the shielding should be checked for good metal-to-metal contact and all the screws inspected to be sure they are in place and tight.

Any testing of heaters such as measuring grid current, adjusting taps on the tank coil, or making other adjustments with any part of the cabinet or screening removed must be done in a shielded room provided for the purpose.

A plant having a large number of these heaters operating on a round-the-clock schedule might have at least one machine undergoing adjustments or test most of the time. This one machine, if not in a shielded room, could raise havoc in the neighborhood if operated with a side panel off and would cancel all the good accomplished by the modification of all other machines.

The results obtained in the above project should be of special interest to plastic products plant managers because they are the ones faced with the purchase of new equipment to meet FCC regulations if they do not modify their present

Table V—Preheater #5 Before and After Treatment

Distance from #5	*uv/m—frequency 25 mc.*		*Harmonics*	
	before	*after*	*before*	*after*
	uv/m	*uv/m*	*uv/m*	*uv/m*
10 ft.	38,500	920	462	35
80 ft.	970	8	118	0
150 ft. near main power line[a]	835	0	68	0

[a] Above measurements taken 50 ft. or less from power line.

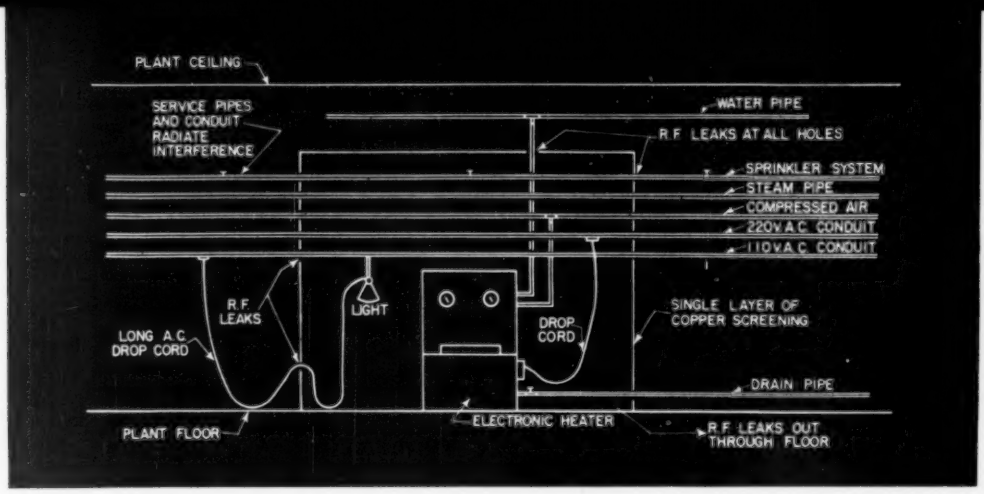


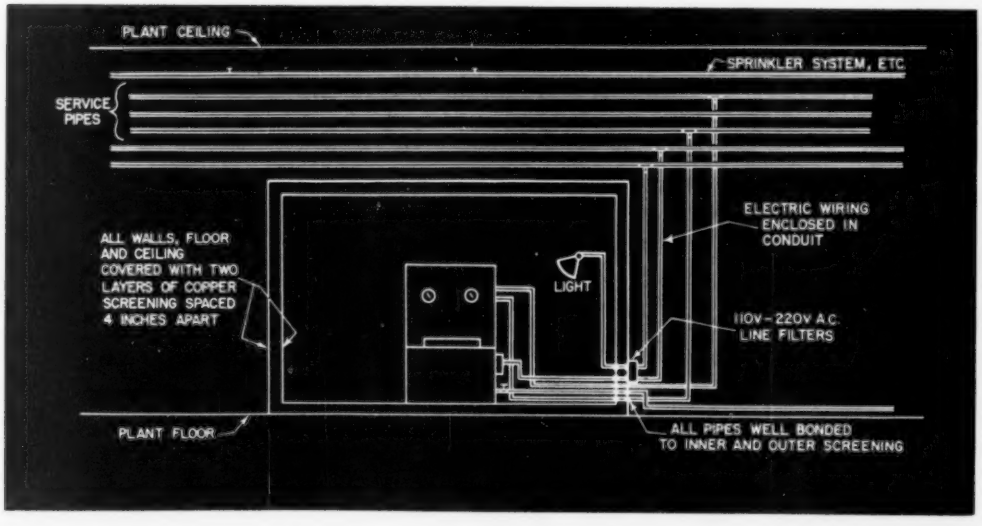
Fig. 14—Improper construction of screened room around overhead pipes and conduit will achieve little or no attenuation of radio interference. All metal lines passing through screened area as well as extension cords will radiate signals as if they were antennas

equipment. The results should also be of interest not only to other manufacturers using this type of equipment for metal heating, but also to the manufacturers of the electronic heaters themselves. The same methods used in eliminating radio interference from old machines can just as well be applied to new equipment.

Remember that a pail and a sieve are both made of metal but the pail holds water while the sieve leaks. Fortunately, a radio shield does not have to be water tight. However, all cracks longer than 1 in. and all holes larger than $\frac{1}{8}$ in. in diameter must be covered with sheet metal or screening. All metal-to-metal joints must have the paint removed and must make good contact. Bolts and screws fastening panels should be spaced no more than 2 or 3 in. apart, not for mechanical strength, but for better shielding.

Last, but not least, no metal object or wire can enter the shielded area without either complete bonding at the point of entry or complete filtering in the case of wire. Remember, there are no half-way remedies. The sieve of water still leaks until you plug the last hole.

Fig. 15—Preferred method of shielding room employs two layers of copper screening on sides, ceiling, and floor. All metal objects enter through one protected point; electric wire is fed via a conduit to a shielded line filter; joints are covered with screening



Effect of Orientation on the Mechanical Properties of Polystyrene†

by R. G. CHEATHAM†† and A. G. H. DIETZ†††

Extruded polystyrene rod was first annealed, and then stretched hot to elongations as high as 12,000%. Tests were made in tension, flexure, and torsion at temperatures ranging from 0 to 80° C. and at strain and load rates ranging from creep and relaxation to 1.0 in./in./min. and 10,000 lb./min. to determine the effect of orientation upon these mechanical properties. Tensile and flexural strengths increased two- to threefold, depending upon rate and temperature; torsional strength decreased; and modulus of elasticity increased moderately. Fracture changed from a sharp break to a fibrous separation. Birefringence measurements revealed marked orientation of the material, but low-angle X-ray diffraction studies revealed no "crystalline" structure.

ORIENTATION effects have often been noted in high polymers such as polystyrene. In injection molded pieces, for example, strength properties frequently are different in different directions with respect to the flow of the material, and decided "skin" effects appear; that is, the material adjacent to the surface of the mold behaves differently from the material in the body of the molded part. Polystyrene sheet, if stretched during the manufacturing process, behaves differently from unstretched sheet. Double stretching of such sheet is, therefore, practiced to improve mechanical properties[1].

Stretch orientation of polystyrene has been studied by a number of investigators, particularly Bailey[1], who reported experiments with small rods, fibers, and sheet stock; increased tensile strengths in the direction of stretching, increased toughness, and decreased crazing were observed. He also reported birefringence measurements made to define orientation in the material.

Maxwell and Rahm[2] have reported in previous publications that: 1) samples oriented normal to the direction of tensile testing crazed more quickly than unoriented samples; and 2) the orientation causes a pronounced increase in the time for crazing to start and a decrease in the rate at which it progresses. They concluded that the chains oriented in the direction of tension strengthen the sample against crazing.

Neilsen[3] reported that both the dynamic Young's modulus and the modulus calculated from the stress-strain curves of oriented polystyrene films increase with increasing orientation. Increasing the stretching temperature decreases the orientation when other variables are held constant. The elongation to break and the ultimate strength both tend to increase with the amount of stretch. The softening temperature or tensile heat distortion decreases as the orientation increases.

The object of the investigation re-

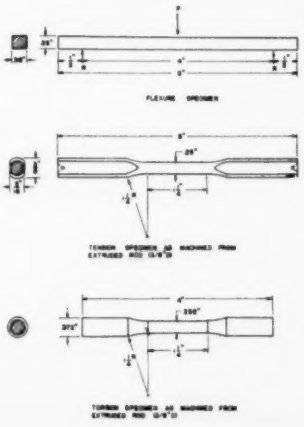
[1] J. Bailey, India Rubber World *188*, 225 (May 1948).
[2] B. Maxwell and L. F. Rahm, SPE J. *6*, 7 (Nov. 1950).
[3] L. E. Nielsen and R. Buchdahl, J. Applied Physics *21*, 488 (June 1950).

Table I—Torsion Tests of Oriented Polystyrene[a]

Elongation	*Max. shearing stress*	*Shearing modulus*
%	*p. s. i.*	*p. s. i.*
0	8200	207,000
628	5325	208,000
720	6700	210,000
1462	6230	207,000

[a] Conditions of test: constant rate of strain, 0.1 rad./in./min.; 23 ± 1° C.; 50 ± 2% R.H.

Fig. 1—Flexural, tensile, and torsional specimens milled from annealed rod



* Reg. U. S. Pat. Office.
† Presented at the June 1950 meeting of the American Society of Mechanical Engineers in Toronto, Canada, before the Rubber and Plastics Division.
†† Research assistant, Plastics Research Laboratory, Massachusetts Institute of Technology, Cambridge, Mass.
††† Professor of structural engineering, Dept. of Building Engineering and Construction; director, Plastics Research Laboratory, Massachusetts Institute of Technology, Cambridge, Mass.

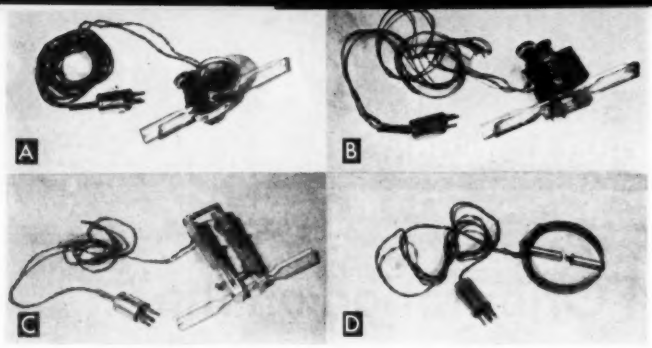


Fig. 2—Extensometer types for mechanical tests: A) True-strain wheel. As specimen stretches, wheel rotates and moves contact on the circular slide wire; B) Wheel-torsion. Wheel rotates as specimen twists; C) U-bar for ordinary strain; D) Transverse. Fingers follow changes in diameter, inducing strains in strain gages attached to circular spring

ported here was to determine some of the effects of orientation upon the mechanical properties of polystyrene. The principal variables studied were degree of orientation, temperature, and rate of strain, and their effects upon the strength in tension, torsion, and flexure. Birefringence and X-ray measurements were made to gain some insight into the effect of orientation on the internal structure of the polystyrene.

Preparation of Specimens

The material as supplied consisted of extruded rods approximately ⅜ in. in diameter. The manufacturer described it as follows: average relative molecular weight before extrusion, calculated by the Staudinger equation, 70,000; monomer content less than 1%; methanol insolubles greater than 99 percent.

Examination with polarized light revealed locked-in stresses. Consequently, the rods were annealed by immersion in mineral oil (Nujol), held at 138° C. for 15 min. and then cooled to slightly above room temperature, whereupon the rods were removed from the bath, wiped clean, and re-examined with polarized light. When this schedule was carefully followed, locked-in stresses as revealed by polarized light disappeared without evident damage to the material.

Oriented specimens were prepared by stretching inch-long sections of annealed rod by hand in the mineral oil bath at temperature of 145 ± 5° C. After stretching, the specimens were removed from the bath, and, while rigidly held, allowed to cool in laboratory air.

Degree of orientation or elongation was measured by the reduction in cross-sectional area. By this method, elongations up to 12,000% were obtained.

"Elastic memory" of the oriented material was found to be high. Specimens stretched 12,000% and held at standard laboratory temperatures and relative humidities for 4 months returned to within 10 to 15% of their original length when reimmersed in oil at 145° C.

Tensile, flexural, and torsional specimens were milled from the annealed rod to the dimensions shown in Fig. 1. Flexural specimens of oriented material were formed by first milling the annealed rod to a rectangular cross section and then hot-stretching as described above. The specimens decreased in cross-section but retained their rectangular proportions. Oriented torsional specimens were first milled to the shape shown, and were then elongated. Oriented tensile pieces were not milled before or after elongation.

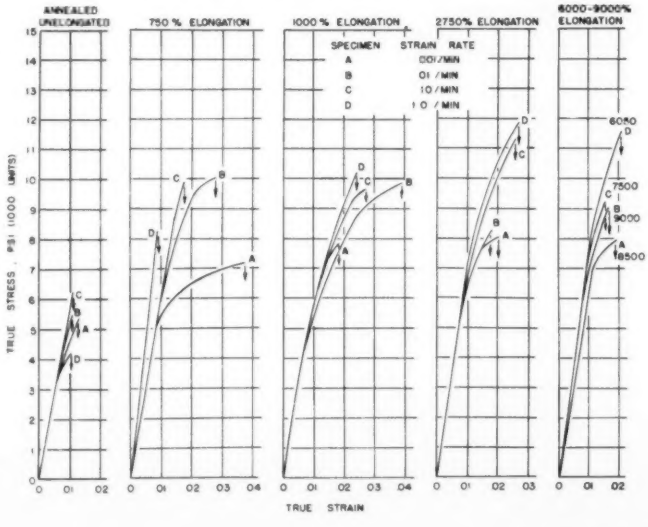
Testing Procedure

Tests were conducted on the universal plastics testing machine developed in this laboratory for plastics testing, and already described elsewhere[4, 5]. Briefly, it incorporates servomechanisms in a hydraulic system to provide controlled crosshead motion. Extensometers developed for the equipment can be used to measure ordinary strain—sometimes called nominal or engineering strain and true strain, sometimes called logarithmic strain—and to control operation of servomechanisms.

The true-strain longitudinal extensometer[3] shown in Fig. 2 consists essentially of a wheel and a knife edge. When this is clamped to the side of the specimen, the stretching of the specimen causes the wheel to rotate. Rotation of the wheel is therefore directly proportional to true strain in the specimen. The

[4] G. S. Burr, W. J. Gailus, J. O. Silvey, S. Yurenka, and A. G. H. Dietz, ASTM Bull. No. 149, 51 (Dec. 1947).
[5] A. G. H. Dietz, W. J. Gailus, and S. Yurenka, Proc. A.S.T.M. 48, 1160 (1948).

Fig. 3—Series of true stress-strain curves in tension at various constant strain rates for annealed unoriented and elongated polystyrene at 23° C., 50% relative humidity



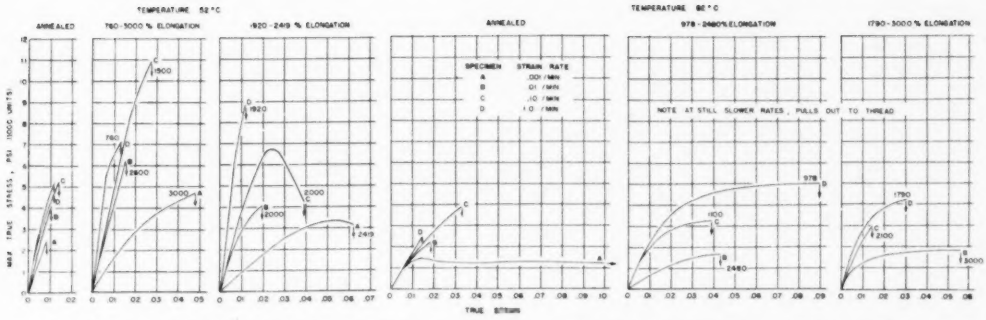


Fig. 4—True stress-strain curves in tension at various constant strain rates for annealed unoriented and for elongated polystyrene at 52° C. (trio at left) and 82° C. (three graphs at right), 50% R.H. Numbers on curves refer to elongation percent before test

wheel is attached to a slide wire potentiometer, and compressive or tensile strain therefore brings about a change of potential which is used to control the servomechanism, to drive a recorder, or both.

The torsion extensometer (Fig. 2) is similar to the true-strain longitudinal extensometer except that the wheel is turned at right angles to the longitudinal axis of the specimen so that twisting of the specimen causes the wheel to rotate. The rate of torsion can therefore be measured and controlled in a manner similar to the longitudinal strain.

For small strains a U-bar extensometer[5] has been used for some time (Fig. 2). This simply consists of two bars provided with knife edges at one end and rigidly fastened at the other end to a cross-piece to which strain gages are cemented. When the bars are clamped with their knife edges to the specimen, longitudinal strains cause the specimen ends of the bars to separate and to bend the cross-piece, thereby developing a signal in the strain gages. This signal is proportional to the longitudinal strain and can be used to control the servomechanism, to drive a recorder, or both. This type, called a π-gage[6], measures ordinary rather than true strain.

If a specimen "necks" inside or de-

[6] C. C. Hsiao and J. A. Sauer, ASTM Bull. No. 172, 29 (Feb. 1951).

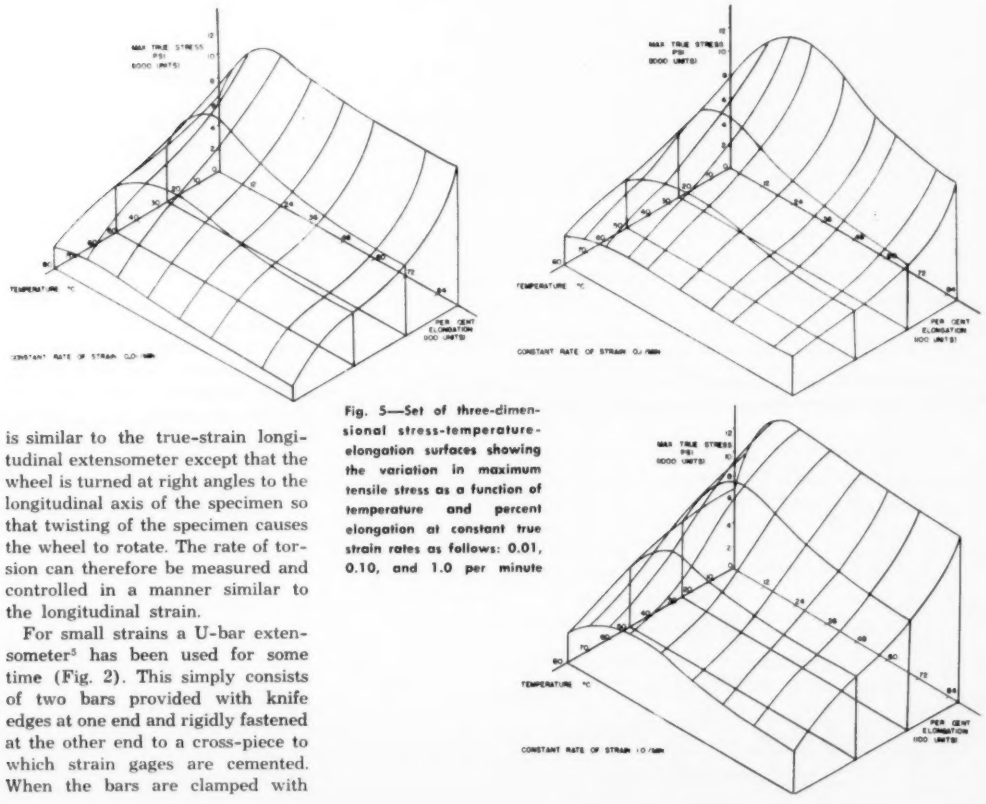


Fig. 5—Set of three-dimensional stress-temperature-elongation surfaces showing the variation in maximum tensile stress as a function of temperature and percent elongation at constant true strain rates as follows: 0.01, 0.10, and 1.0 per minute

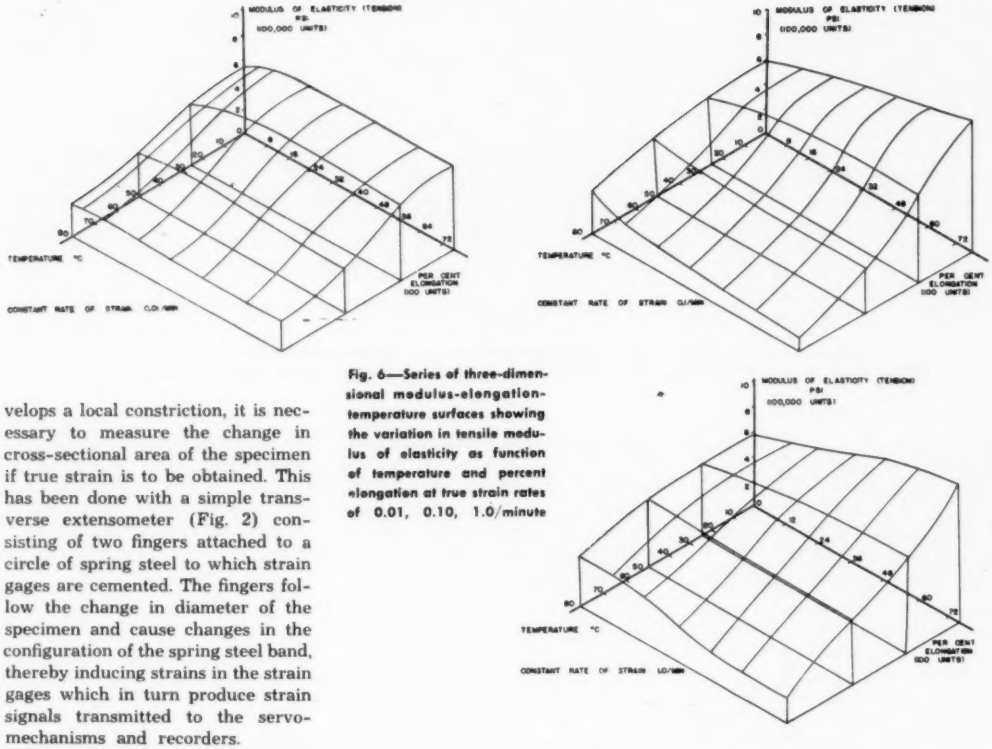


Fig. 6—Series of three-dimensional modulus-elongation-temperature surfaces showing the variation in tensile modulus of elasticity as function of temperature and percent elongation at true strain rates of 0.01, 0.10, 1.0/minute

velops a local constriction, it is necessary to measure the change in cross-sectional area of the specimen if true strain is to be obtained. This has been done with a simple transverse extensometer (Fig. 2) consisting of two fingers attached to a circle of spring steel to which strain gages are cemented. The fingers follow the change in diameter of the specimen and cause changes in the configuration of the spring steel band, thereby inducing strains in the strain gages which in turn produce strain signals transmitted to the servomechanisms and recorders.

Most of the tests in tension and torsion reported here were carried on with the true strain extensometers, but a few were carried on at constant rates of load increase. With the small strains encountered in most of the tests, the difference between true strain and ordinary or nominal strain is small. Flexural tests were carried on at constant rates of crosshead motion.

For tests carried on at high and low temperatures an enclosure was placed around the specimens, and air of the required temperatures and relative humidities was circulated around the specimens from a source consisting of a standard Tenney controlled-atmosphere unit.

Tension Test Results

Principal test results are shown in Fig. 3 and 4. Fig. 3 gives the results of a typical series of tests at constant rates of strain under standard atmospheric conditions (23 ±1° C., 50 ±2% R. H.). Material ranges from unoriented and annealed to 9000% elongation. The principal effect of orientation is to cause an increase in tensile strength, which

Fig. 7—Ultimate tensile stresses attained in tension tests at various constant rates of load on annealed unoriented and on elongated polystyrene at 23° C., and 50% R.H.

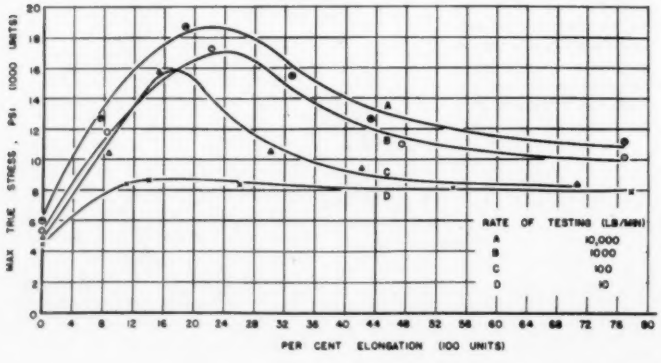
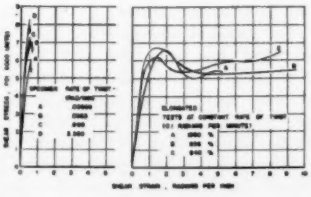


Fig. 8—Torsion shear stress-strain curves for annealed unoriented (left) and for elongated polystyrene (right) at temperature of 23° C., 50% relative humidity, rates of twist as shown



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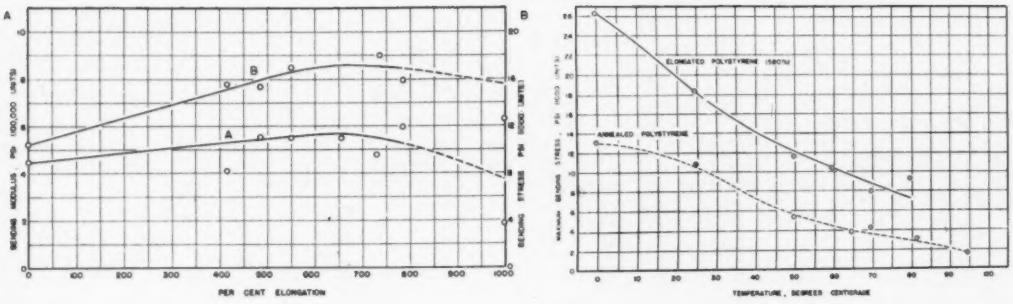


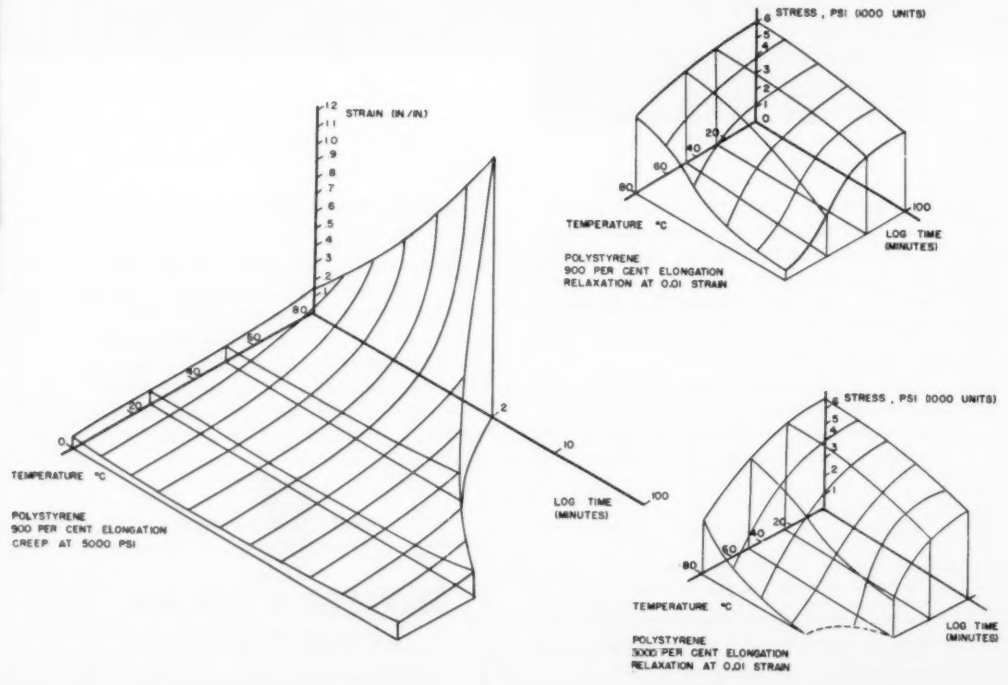
Fig. 9, (left)—Bending modulus of elasticity and maximum flexural stress obtained at 23° C. and 50% relative humidity for various elongation percentages; bending stress rises to an upper value with increasing elongation. Fig. 10, (right)—Effect of temperature on maximum flexural stress obtained in annealed unoriented polystyrene, and in polystyrene elongated about 600 percent

reaches a maximum of approximately double the strength of the unoriented material at high strain rates and elongations above 1000 percent. The unoriented material all fractures at nearly the same strain, approximately 0.012; the oriented material is more irregular in its behavior but in general undergoes larger strains, some as high as 0.038, especially at slower rates of strain.

In general, the higher the strain rate, the higher the maximum strain. However, exceptions to the general trend are to be found, particularly at the highest strain rate of 1.0 per min. which in several instances resulted in fracture at stresses lower than those attained at lower rates.

Increased temperatures in general result in lower maximum stresses and increased strains, with the same effects as before (Fig. 4). At low rates of strain and highest temperatures the annealed material shows a tendency to flow. The oriented materials tend to constrict or "neck," causing a downward dip in the stress-strain curve after such constriction occurs (see also photographs in Fig. 13). It is no longer correct to call these curves true

Fig. 11—Three-dimensional surfaces for creep (900%) and relaxation (900 and 3000%) as functions of time and temperature



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stress-true strain curves beyond the constriction points, but the curves have been drawn as shown to emphasize the effect.

The relationship among maximum stress, percent elongation, and temperature for constant strain rates of 0.01, 0.10, and 1.00 per min. is shown in Fig. 5. At all temperatures, maximum stress rises with orientation up to approximately 1200%, after which it drops a small amount and at higher elongations remains relatively constant, no matter how highly elongated. The most marked changes occur at approximately room temperature. The maximum stresses attained by the more highly elongated materials are more sensitive to temperature change at high and low temperatures than is true of the unoriented material.

Modulus of elasticity, defined as the slope of the stress-strain curve at the origin, shows a somewhat similar trend, as may be seen in Fig. 6. At low temperatures the modulus is higher than at high temperatures. At low temperatures the modulus rises moderately with increased elongation and remains essentially constant at elongations greater than approximately 1200%, but the reverse is true at high temperatures where a moderate drop in modulus accompanies an increase in elongation. Modulus values tend to be somewhat higher at higher rates of strain.

Tests run at constant rates of load application show a more marked effect of elongation upon strength, as is brought out in Fig. 7. A steep rise in strength is experienced, particularly at higher rates of load, until a maximum occurs at approximately 2000 percent after which the strength decreases but remains substantially higher than the unoriented material. Threefold increases in strength are found in several instances.

Torsion Test Results

A few tests were run in torsion at standard atmospheric conditions on annealed unoriented and on oriented material. Shearing strength and shearing modulus values were obtained. In some instances different rates of rotation of the collets holding the specimen were employed, and in others different rates of strain, as controlled by the strain extensometer. The results were similar in both instances.

For a given rate of test, the oriented material was weaker than the unoriented, as shown in Table I.

Typical stress-strain curves are shown in Fig. 8. The unoriented material is relatively inextensible, and breaks by shattering into small fragments. The oriented material, on the other hand, twists through a considerable angle and breaks in a fibrous, helical fracture oriented at roughly 45° to the axis (Fig. 13). Complete fracture does not occur.

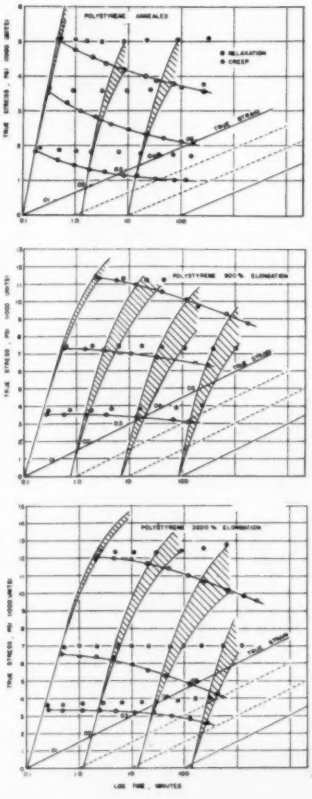
Flexure Test Results

Flexure tests were made on specimens elongated as much as 1000 percent. Specimens elongated more than this proved difficult to measure accurately because of their small dimensions, and the results obtained at 1000 percent are regarded as being uncertain.

Figure 9 shows the same general trend as the tension tests; that is, maximum bending stress increases with increasing percentage elongation to an upper value, which is attained at approximately 600 to 700 percent elongation. At higher elongations there is no increase in maximum bending stress, and there probably is some decrease as indicated by the values obtained at 800 to 1000 percent elongation. The same trend is observable in the values of modulus of elasticity except that the trend is less marked.

With increasing temperature, a decrease in maximum bending stress is observable, as shown in Fig. 10, which compares the trend in annealed unoriented material and in material elongated approximately 600 percent. Reduction in maximum bending stress is similar in both instances, but the oriented material remains stronger than the unoriented at all temperatures.

Fig. 12—Three-dimensional surfaces showing true stress, strain, log time relation in tensile creep and relaxation at 23° C., 50% R.H. for annealed unoriented specimens and material elongated 900 and 3000 percent. Relaxation surfaces lie below creep surfaces as shown by sections taken at minute intervals of about 0.1, 1, 10, and 100



Creep and Relaxation

The effect of orientation and temperature on the creep and relaxation behavior of polystyrene was studied by 1) subjecting unoriented and oriented specimens to predetermined tensile stresses and recording the change of strain, and 2) subjecting specimens to predetermined tensile strains and recording the changes in stress. Time required to load the specimens to the required level of stress or strain varied from 0.05 min. for the lowest levels, to 0.30 min. for the highest levels.

Typical three-dimensional creep and relaxation plots are shown in Fig. 11. The creep surface at 900 percent elongation and under 5000 p.s.i. stress intensity shows a marked temperature dependence. Creep is small at low temperatures, but becomes large at high temperatures, until at 80° C. the material simply draws out and continues to elongate rapidly in a short time.

The two relaxation surfaces for 900 and 3000 percent elongation and 0.01 strain show temperature dependence similar to creep. At low temperatures relaxation occurs slowly in spite of the higher stress, but at high temperatures the stress

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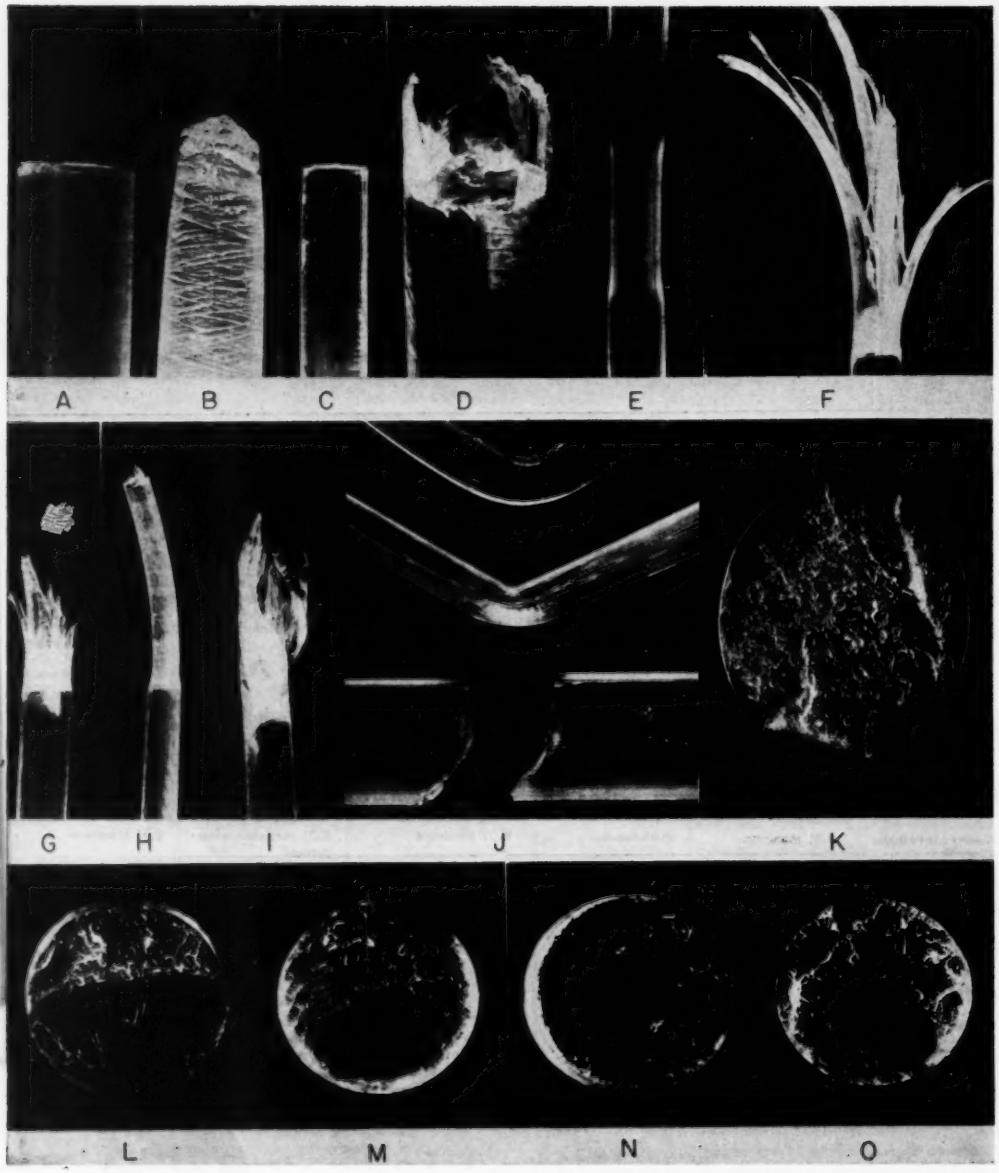

Fig. 13—Photographs A to H inclusive are tension fracture patterns: A) unoriented, 23° C.; B) unoriented, 80° C.; C) 580%, and 0° C.; D) 744% and 23° C.; E) 840% and 52° C.; F) 989% and 23° C.; G) 1313% and 0° C.; H) 2600% and 80° C. Specimen I, torsion, 1960%, 23° C. J) shows flexure specimens; the lower is unoriented, tested at 23° C.; upper two are elongated 580%; uppermost tested at 80° C.; and center at 0° C. K is transverse photo of specimen elongated 1080% and tested at 0, 23, 52, and 82° C.; respectively

falls off rapidly to practically zero. The more highly oriented of the two materials relaxes more rapidly.

Three-dimensional stress-strain-time curves derived from the creep and relaxation results are plotted in Fig. 12. These are for 0, 900, and 3000 percent elongation.

On a plot of this type, horizontal planes at constant stress levels should correspond to creep, and vertical planes at constant strain intervals should correspond to relaxation. In the idealized case, the three-dimensional plots derived

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from creep and relaxation tests would coincide. As these figures show, the creep and relaxation surfaces do not coincide, and the creep surface lies consistently above the relaxation surface at all percentages of elongation. This trend has been brought out by drawing sections through the surfaces at about 0.1, 1.0, 10.0, and 100.0 minutes.

The oriented materials, because they are capable of sustaining larger longitudinal stresses and strains than the unoriented, develop larger surfaces. The surfaces lie fairly close together at small strains, low stresses, and short time periods, but diverge as all three variables increase. Furthermore, the divergence appears to become more marked as the percentages of elongation increase.

The foregoing trend, showing that creep and relaxation surfaces do not coincide, does not appear to bear out the postulate that materials of this kind can be completely defined by equations relating only stress, strain, and strain rate for any temperature.

Crazing and Fracture

A familiar phenomenon in polystyrene subjected to stress is the formation of numerous small lines, called crazing or craze cracks, at right angles to the direction of stress. These have been studied and reported by numerous investigators[7,8]. They are quite typical of polystyrene and occur also in other plastics.

Polystyrene in its normal unoriented state is relatively inextensible in tension and breaks with a sharp fracture at 90° to the tensile stress.

Oriented polystyrene exhibits behavior markedly different from the unoriented material, shown in Fig. 13. Specimens A and B are unoriented material broken in tension at 23 and at 80° C. Specimen A shows numerous craze marks, and the fracture is typical. Specimen B constricted or "necked" a considerable amount before breaking and developed a great many craze marks which are oriented at an appreciable angle in the vicinity of the constriction. Specimen C is elongated 580 percent, but is broken at 0° C. and still exhibits a sharp fracture accompanied by numerous craze marks.

With specimen D, elongated 744 percent and fractured at 23° C., the sharp fracture begins to disappear. The periphery of the fracture exhibits a decided fibrous structure, but the center is typical of unoriented material. Craze marks are still numerous and strongly evident.

Specimen E, elongated 840 percent and tested at 52° C., shows the formation of a constriction or "neck," which is characteristic of material highly oriented, tested at high temperatures, or both. In the "necked" portion extremely numerous, very fine craze marks are seen.

With specimens F and G, elongated 989 and 1313 percent and tested at 23 and 0° C., respectively, the trend first shown in specimen D has become complete. The fracture is fibrous throughout and, in specimen G particularly, crazing has disappeared. These photographs confirm the general observation that at elongations greater than 1100 percent, crazing no longer occurs.

Specimen H, elongated 2600 percent and tested at 80° C., shows the "necking" tendency most markedly. The entire specimen constricted at first, and then formed a secondary, more localized, constriction as shown in the photograph. Because of the high temperature fracture is not fibrous, but there is no crazing.

Specimen I, elongated 1960 percent and tested at 23° C., shows the effect of elongation upon torsion. A markedly fibrous fracture occurs at approximately 45° to the axis. Complete separation does not occur, as contrasted with unelongated material which shatters into many small fragments, making a good photograph impossible.

The specimens shown in J illustrate the effect of orientation on the flexural properties of polystyrene. The upper two specimens are both elongated 580 percent but are tested at different temperatures; the top specimen at 80° C. and the lower one at 0° C. The bottom specimen shows the characteristic type of fracture for the annealed, unoriented polystyrene, tested at 23° C. It therefore can be seen that the oriented polystyrene no longer exhibits the characteristic "sharp" fracture, but rather has become ductile in nature.

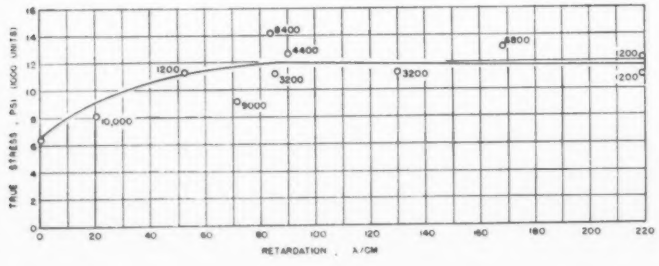
Specimens L, M, N, and O are transverse photomicrographs of fractured surfaces in annealed unoriented material tested at 0, 23, 52, and 82° C., respectively. They show the manner in which fracture originates and spreads, and show the effect of temperature upon the fracture behavior. In each instance the wave originates at a point on the surface and spreads across the specimen. At 0° C. the fracture is essentially smooth and flat over the entire surface, but one "jump" appears to have occurred. At the higher temperatures the initial smooth fracture is smaller than at the lowest temperature and a series of "jumps" appear. At 82° C. the "jump" pattern becomes less distinct.

The source of fracture can perhaps be assumed to be associated with minute flaws on the surface and with a statistical distribution of chain ends leading to internal points of high energy or of weakness. The flaws act as centers of disturbance leading to fracture. It has also been observed that crazing planes occur at many points on the surface and appear to proceed completely across the specimen, although the point of failure is found to occur at some other plane.

Specimen K shows the characteristic fracture of material elongated approximately 900 percent and tested at 0° C. at a high rate of load (approximately 10,000 lb. per minute). With this combination of tem-

[7] B. Maxwell and L. F. Rahm, Ind. Eng. Chem. *41*, 1988 (Sept. 1949).
[8] C. C. Hsiao and J. A. Sauer, J. Applied Physics *21*, 1071 (Nov. 1950).

Fig. 14—Stress vs. retardation, 23° C. Numbers opposite test points = elongation percent



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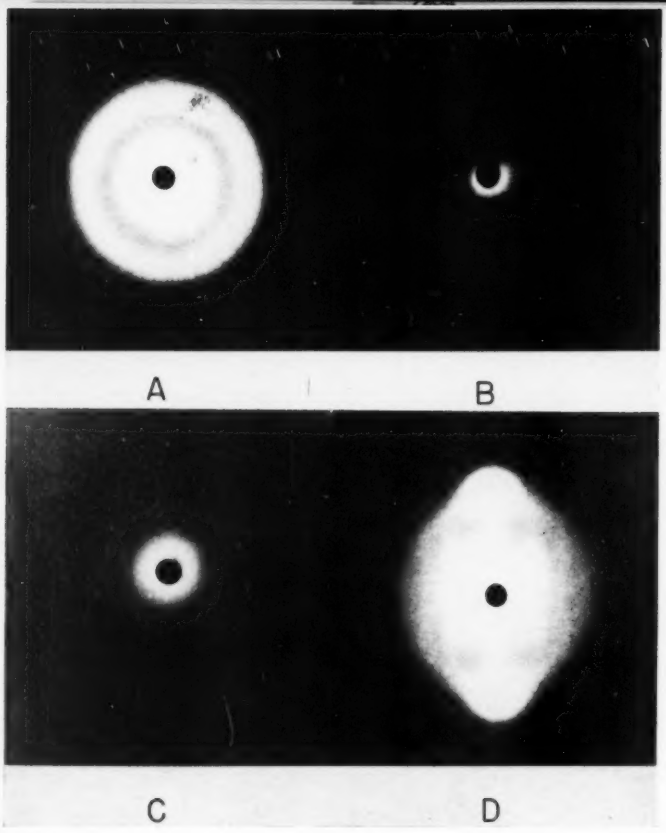

Fig. 15—Low-angle X-ray diffraction photograph. A is annealed unoriented polystyrene; B is an elongation of 3500%; C, 7200% elongation; D, nylon with multiple fibers

perature and rate, the fracture is still fairly sharp, although some fibrous fracture occurs. There is, however, no marked indication of centers of disturbance such as appear in specimens L to O. This lends support to the theory that surface flaws are opened and elongated in the direction of orientation, thereby largely eliminating them as centers of stress concentration leading to fracture. In the interior of the specimen a more homogeneous pattern also appears, possibly indicating a similar elimination of centers of disturbance as orientation of the chains in the direction of elongation occurs.

Measurement of Orientation

Two types of measurements were made in an effort to obtain some insight into the effect of orientation on the internal structure of the material. These were birefringence and low-angle X-ray diffraction. Of these birefringence measurements proved to be the best.

Birefringence—Orientation birefringence is based on an arrangement of asymmetrical molecules not caused by crystallization[9]. Orientation birefringence, which is often called stress, strain, or intrinsic birefringence, is particularly important in the case of plastomers and elastomers, where the chainlike molecules when elongated or stretched become parallel, thus effecting unequal distribution of density in different directions. The occurrence of orientation birefringence is a measure of the degree of orientation of the molecules and has no relation with crystallization effects.

Stress and orientation birefringence are very closely related, since both can be produced as a result of stress. A difference between them may be found in the fact that stress birefringence in a solid-like glass occurs when the mutual distances between the atoms are modified in a definite direction without much displacement of atoms or molecules, while the orientation birefringence is usually achieved by very great displacement of atoms and molecules. The birefringence of polystyrene is negative ($n_{\parallel} < n_{\perp}$). On stretching polystyrene[10,11] the benzene rings which have the highest polarizability in the plane of the ring seem to determine the nature of the birefringence.

Birefringence measurements are made by use of the polariscope which has been described in a number of publications[12]. If a piece of strain-free material is placed between crossed Polaroid disks, a uniform dark field results, but if strain differences are present, a field of light and dark areas is seen. Elongated polystyrene specimens of the type used in this research give patterns of light and dark striations in the longitudinal direction; the more highly oriented the material the greater the number of striations or orders per unit thickness.

Measurement of orders was accomplished by means of compensating wedges, themselves made of polystyrene. Two wedges, one 6 λ (sodium light) and the other 18 λ, were employed. The determination of orders of birefringence was made by placing these wedges at right angles to the longitudinal axes of the specimens and compensating for the pattern found in the specimens.

In Fig. 14 a plot has been made of retardation versus maximum tensile stress and percent elongation. The correspondence between retardation and tensile stress is reasonably close. The percentages of elongation noted at the various individual points indicate an interesting trend made possible by a variation of the standard stretching and cooling technique. It was noted that if a drop of warm oil was permitted to run along the length of the specimen while it was cooling in air, a relaxing, annealing effect occurred which was reflected in the retardation found subsequently in the birefringence measurements. Figure 14 shows this trend. Two specimens elongated

[9] "Elastomers and Plastomers," Vol. I, by R. Houwink. Published in 1950 by Elsevier Publishing Co., Inc., New York, N. Y.

[10] F. H. Muller, Angew. Chem. *53*, 425 (1940).
[11] F. H. Muller, Kolloid Z. *95*, 138, 306 (1941).
[12] "Photoelasticity," by N. Alexander, Rhode Island State College, Kingston, R. I. (1941).

(*Continued on p. 190*)

PLASTICS MACHINERY BULLETIN

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NYLON—New NRM Extruders handle Nylon, other plastics

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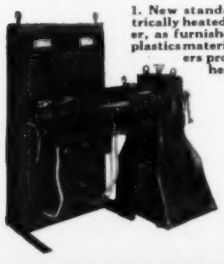
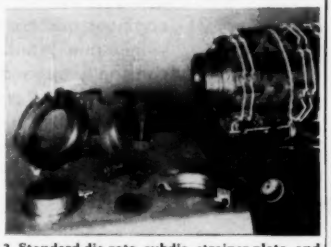
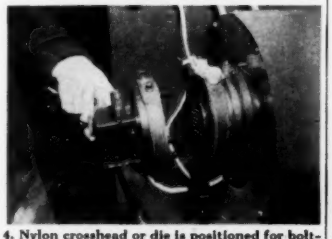


1. New standard 2½″ electrically heated NRM Extruder, as furnished for general plastics materials. Two blowers provide balanced heat control.

2. Die gate swings open easily on hinges. The new front flange is split for easy removal.



3. Standard die gate, subdie, strainer plate, and front end removed from extruder. Note cylinder heater shells and blower for balanced heat control.



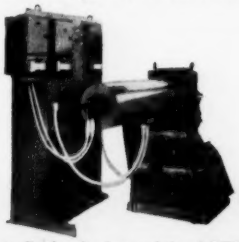
4. Nylon crosshead or die is positioned for bolting directly to cylinder face. This avoids critical temperature variations from heat loss of flange.

5. NRM Extruder set up for covering wire with Nylon. Wire is fed down through preheater to extruder. Covered wire is cooled in water tank under extruder head, is then ready for winding.

Self-contained Nylon Extruder

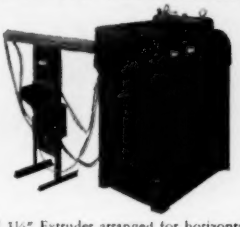
This 1″ NRM bench model is a completely self-contained unit for Nylon covering of wire, sizes B & S Gauge #24 to #36. Unit includes electrically heated extruder, let-off, cooling tank, spark tester, dual capstan, dual take-up, and instrument and control cabinet.

Extrudes Nylon on steel ribbon



Wide application is characteristic of NRM Extruders. This 2½″ model is used to cover a thin steel ribbon with Nylon to produce corset stays. In this unit feed is horizontal. Replacement of heads is simple matter.

Nylon Extruder with horizontal feed



NRM 1½″ Extruder arranged for horizontal feed of wire through preheater. Only NRM Extruders provide balanced heat control, with absolute control over frictional heat. This feature is self-contained, requires no pipe connections for compressed air, oil, or water.

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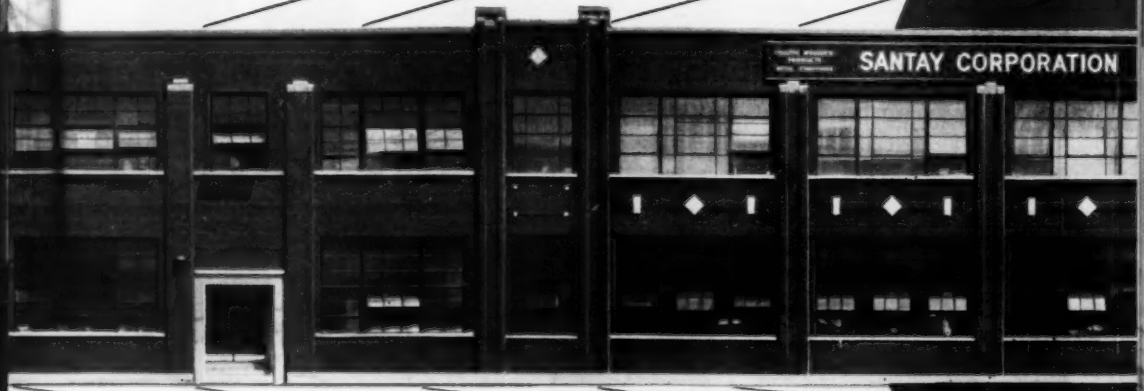

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U. S. PLASTICS PATENTS

Copies of these patents are available from the U. S. Patent Office, Washington, D. C., at 25¢ each.

MOLDING. G. J. Kovacs. U.S. 2,551,-439, May 1. Continuously injecting a thermoplastic resin.

POLYVINYL ETHERS. C. E. Schildknecht (to General Aniline). U.S. 2,551,467, May 1. Acid catalyst polymerization of gaseous vinyl ethers.

COPOLYMER. W. K. Wilson (to Shawinigan). U.S. 2,551,481, May 1. Copolymer of a vinyl ester and the reaction product of cyclohexanol and an unsaturated dibasic carboxylic acid.

POLYAMIDES. J. Prochazka (to Bata norodni podnik). U. S. 2,551,702, May 8. Producing polyamides by polymerizing 6-caprolactam.

TUBING. C. E. Slaughter (to Extruded Plastics). U. S. 2,551,710, May 8. Light-transmitting thermoplastic tubing.

POLYESTERS. J. G. N. Drewitt and J. Lincoln (to Celanese). U. S. 2,551,-731, May 8. Polyesters from heterocyclic acids.

POLYESTERS. J. G. N. Drewitt and J. Lincoln (to Celanese). U. S. 2,551,-732, May 8. Polyesters from sodium terephthalate and ethylene chlorhydrin.

COPOLYMER. L. H. Perry (to Union Bay State). U. S. 2,551,760, May 8. High styrene-butadiene copolymer.

PINHEADS. J. Meyer. U. S. 2,551,-960, May 8. Machine for attaching plastic heads to pins.

FILM TREATMENT. R. F. Pierce (to Visking). U. S. 2,551,966, May 8. Apparatus for heat strengthening thermoplastic film.

CONDENSATES. E. A. Barr, Jr. (to Carbide and Carbon). U. S. 2,552,025, May 8. Condensate of a phenol, an adlehyde, and an aromatic amine.

SILOXANES. W. J. Wormuth (to G. E.). U. S. 2,552,247, May 8. Copolymerizing organo-polysiloxanes.

POLYVINYL HALIDES. W. S. Emerson and R. A. Heimsch (to Monsanto). U. S. 2,552,269, May 8. Plasticized films of polyvinyl chloride.

CONDENSATES. D. W. Jayne, Jr. and H. M. Day (to American Cyanamid). U. S. 2,552,321, May 8. Waxy condensate of alkylolamine, fatty acid, and polycarboxylic acid.

POLYMERS. E. L. Kropa (to American Cyanamid). U. S. 2,552,327-8-9, May 8. Ethyl acrylate polymerized in the presence of *m*-phenylenediamine, phenol, or phloroglucinol.

MOLDING. H. I. Reiskind and G. W. Longacre (to Radio Corp). U. S. 2,552,458, May 8. An electronically controlled multiple molding press.

ABRASIVE. E. E. Howard and G. J. Goepfert (to Carborundum). U. S. 2,552,485, May 8. Abrasive comprising abrasive bonded element bonded to a supporting element with a phenol-aldehyde polyvinyl acetal adhesive.

ABRASIVE. C. von Doenhoff (to Carborundum). U. S. 2,552,500, May 8. Abrasives bonded with a methyl pentadiene elastomer.

VINYL HALIDES. C. B. Havens (to Dow). U. S. 2,552,551, May 15. Light stabilizers for polyvinyl halides.

MOLDING. W. R. Smith, E. R. Mellenger, and D. F. Othmer (to D. F. Othmer, W. R. White, Jr., and L. Ricciardi). U. S. 2,552,597, May 15. Molding composition of lignocellulose and sulfur.

WALL COVERING. W. Stubblebine (to Armstrong Cork). U. S. 2,552,600, May 15. Composition of a filler, polyvinyl alcohol, linoleum cement, and a heat-convertible oil-soluble phenolic resin.

CONTAINER. W. L. Morrison. U. S. 2,552,641, May 15. Heat insulated container having foamed plastic insulation.

RESINS. E. Kroft, Jr. (to Socony-Vacuum). U. S. 2,552,796, May 15. Thiophene-sulfur monochloride resins.

CELLULOSE ESTERS. G. W. Seymour, B. B. White, L. J. Rosen, and L. Kruth (to Celanese). U S. 2,552,820, May 15. Production of cellulose acetate-crotonate.

VINYL RESINS. R. G. Newberg, O. C. Slotterbeck, and B. M. Vanderbilt (to Standard Oil). U. S. 2,552,904, May 15. Vinyl resins plasticized with liquid copolymer of a diolefin and a nitrile.

GLASS FIBERS. R. Steinman (to Owens-Corning Fiberglas). U. S. 2,552,910, May 15. Coating glass fibers with a Werner-type compound and a thermoplastic polymer.

MOLDING. S. D. Bradley (to Detroit Macoid). U. S. 2,553,076, May 15. Screw-feed mechanism for a plastic fabricating machine.

CONDENSATE. M. W. Harmon (to Monsanto). U. S. 2,553,190, May 15. Formaldehyde-mercapto thiazoline condensates.

POLYSULFIDES. J. C. Patrick (to Thiokol). U. S. 2,553,206, May 15. Odorless plastic polysulfide.

FRICTION MATERIAL. H. W. Schultz (to General Motors). U. S. 2,553,215, May 15. Molded composition including polymerized cashew nut shell liquid as binder.

BONDING. H. C. Hagedorn (to Nordisk Insulin-laboratorien). U. S. 2,553,259, May 15. Bonding plastic materials with the aid of irradiation.

PLASTICIZERS. D. Faulkner (to Distillers Ltd.). U. S. 2,553,308, May 15. Vinylidene chloride resins plasticized with cyanoalkyl ethers.

POLYSILAZINES. C. P. Haber (to G. E.). U. S. 2,553,314, May 15. Methyl polysilazine composition for rendering glass water-repellent.

POLYMERIZATION. J. A. Loritsch (to G. E.). U. S. 2,553,325, May 15. Polymerizing diallyl phthalate-diethylene glycol maleate composition with a peroxy catalyst and isoascorbic acid.

INSULATION. E. M. Dannenberg (to Sprague Electric). U. S. 2,553,362, May 15. Mixture of a resinous organo polysiloxane and a hydroxylamine.

RESINS. M. J. Scott and E. F. Jackson (to Monsanto). U. S. 2,553,386, May 15. Reaction products of mela-

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mine, an aldehyde, a nitroparaffin, and hydrogen.

MOLDING COMPOSITION. C. C. Heritage (to Wood Conversion). U. S. 2,553,412, May 15. Hot-moldable composition of feltable steam-treated wood fibers and a thermosetting resin.

INTERPOLYMERS. P. O. Tawney (to U. S. Rubber). U. S. 2,553,430-1, May 15. Soluble polymers of tris-2-alkenyl aconites with 2-alkenyl chlorides and olefinic benzenes.

RESIN. M. Baer (to Monsanto). U. S. 2,553,524, May 15. Reacting aminotriazine-aldehyde with vinyl acetate-maleic anhydride copolymer.

RESIN. H. Ellerhorst, Jr. (to Interchemical). U. S. 2,553 643, May 22. Polysiloxane resin containing an aryl phosphinic acid or ester.

POLYMERS. A. M. Gessler (to Standard Oil). U. S. 2,553,651, May 22. Polymers of cyclic dimers of diolefins as plasticizers for oil-resistant elastomers.

CELLULOSE ESTERS. M. E. Martin and L. G. Reed (to Celanese). U. S. 2,553,664, May 22. Cellulose acetate of improved molding properties.

RESIN. C. S. Rowland (to Interchemical). U. S. 2,553,677, May 22. Synthetic resin from furfuryl alcohol with boron trifluoride catalyst.

RESIN. H. H. Scholz and A. M. Taylor (to Interchemical). U. S. 2,553,682, May 22. Oil-modified alkyd resin limited by cellulose derivative.

POLYMERS. A. L. Wilson (to Carbide and Carbon). U. S. 2,553,696, May 22. Water-soluble polymers of lower alkylene imines.

CELLULOSE DERIVATIVES. L. N. Rogers, W. A. Mueller, and E. E. Hembree (to Buckey Cotton Oil). U. S. 2,553,725, May 22. Process for preparing salts of acidic esters of cellulose.

POLYMERIZATION. T. W. Sarge (to Dow). U. S. 2,553,982, May 22. Polymerizing vinylidene chloride in the presence of phenolic inhibitor.

PLASTICIZERS. L. S. Abbott (to Distillers, Ltd.). U. S. 2,553,996, May 22. Polyvinyl chloride resins plasticized by vinyl cyclohexane-3, 4-diol.

ANTACID. M. J. Sullivan and G. J. Martin (to National Drug). U. S.

2,554,072, May 22. Finely divided anion-exchange resin of phenol, formaldehyde, alkylene polyamide.

STABILIZER. O. J. Grummitt (to Sherwin-Williams). U. S. 2,554,142, May 22. Halogen-containing polymer stabilized with a polymer of a metal salt of an olefinic acid.

LAMINATES. R. L. Moore (to Wingfoot). U. S. 2,554,150, May 22. Laminates of thermoplastic sheets.

TAPE. L. J. Von Gunten (to Wingfoot). U. S. 2,554,160, May 22. Applying heat-sealable tear tape to a thermoplastic film.

UREA ALDEHYDE. J. W. Wandell (to Wandell Associates). U. S. 2,554,161, May 22. Drying urea-aldehyde condensates containing clay as a filler.

POLYSILOXANES. M. J. Hunter (to Dow Corning). U. S. 2,554,193, May 22. Wax-like methylpolysilane.

PLASTICIZER. L. A. Mikeska and D. W. Young (to Standard Oil). U. S. 2,554,259, May 22 Oxidized polypropylene.

COATING. O. C. Slotterbeck and D. W. Young (to Standard Oil). U. S. 2,554,273, May 22 Linseed oil-diisobutylene-butadiene copolymer.

RESIN. O. V. Tracy (to Standard Oil). U. S. 2,554,280, May 22. Butadiene-diisobutylene copolymer combined with a fatty oil.

UREA ALDEHYDE. T. J. Suen (to American Cyanamid). U. S. 2,554,424, May 22. Urea-aldehyde condensates.

CELLULOSE TREATMENT. L. H. Bock (to Rohm and Haas). U. S. 2,554,439, May 22. Modification of cellulose by boron trifluoride solution.

COATING. L. Bryan (to California Research). U. S. 2,554,453, May 22. Device for applying plastic coating to bare pipe.

INSULATOR. D. A. Howes and S. R. Pethrick (to Anglo-Iranian Oil). U. S. 2,554,461, May 22. Composition of aluminum stearate, rubber, polyethylene, or polyisobutylene.

RESINS. T. J. Suen and J. H. Daniel, Jr. (to American Cyanamid). U. S. 2,554,475, May 22. Cationic urea-aldehyde-polyfunctional amine compositions.

ROSIN. D. S. Breslow (to Her-

(*Continued on p. 137*)

cules). U. S. 2,554,487, May 29. Heating a rosinyl material with a material such as a peroxide or an organometallic compound to polymerize.

POLYMERS. J. T. Fitzpatrick (to Carbide and Carbon). U. S. 2,554 528, May 29. Polymeric reaction products of ketone and crotonaldehyde.

CATALYST. H. L. Gerhart and W. H. Lycan (to Pittsburgh Plate Glass). U. S. 2,554,567, May 29. A polyester of a dihydric alcohol and an unsaturated acid containing a peroxy catalyst.

POLYAMIDES. J. Prechazka (to Bata norodni podnik). U. S. 2,554,592, May 29. Mixing 6-aminocaproic acid with 6-caprolactam; polymerizing.

PAPER TREATMENT. W. W. Cowgill (to U. S. Rubber). U. S. 2 554,662-3, May 29. Glossing paper with resinous materials.

CHLORINATED RUBBER. M. E. Gross and E. B. Newton (to Goodrich). U. S. 2,554,700, May 29. Reducing chlorine in chlorinated rubber.

BRISTLES. R. Dangin (to LaBrosse and J. DuPont Rennis). U. S. 2,554,777, May 29. Method of polishing the ends of thermoplastic brush bristles.

ROSIN. D. S. Breslow (to Hercules). U. S. 2,554,810, May 29. Polymerizing dehydrogenated rosin acids.

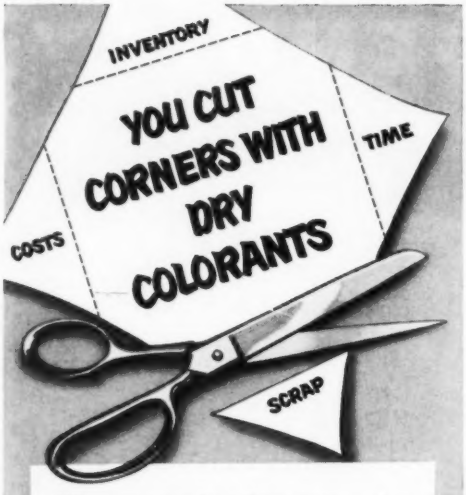
LIGHT POLARIZER. F. J. Binda (to Polaroid). U. S. 2,554,850, May 29. Heat-resistant polyvinyl compound containing polyvinyl borate and borax.

PAPER TREATMENT. W. W. Cowgill (to U. S. Rubber). U. S. 2,554 899, May 29. Treating paper with styrene-butadiene copolymer.

POLYMERS. S. P. Rowland (to Rohm & Haas). U. S. 2,554,959, May 29. Polymeric imido esters of maleic anhydride heteropolymers and 2-(11-hydroxy-8-heptadecenyl) oxazolines.

Correction

On page 112 of the July 1951 issue of *Modern Plastics*, in the story, "Unplasticized Polyvinyl Chloride," the proportion of Ampho soap referred to in the third line of the last paragraph should read "...5 percent..."



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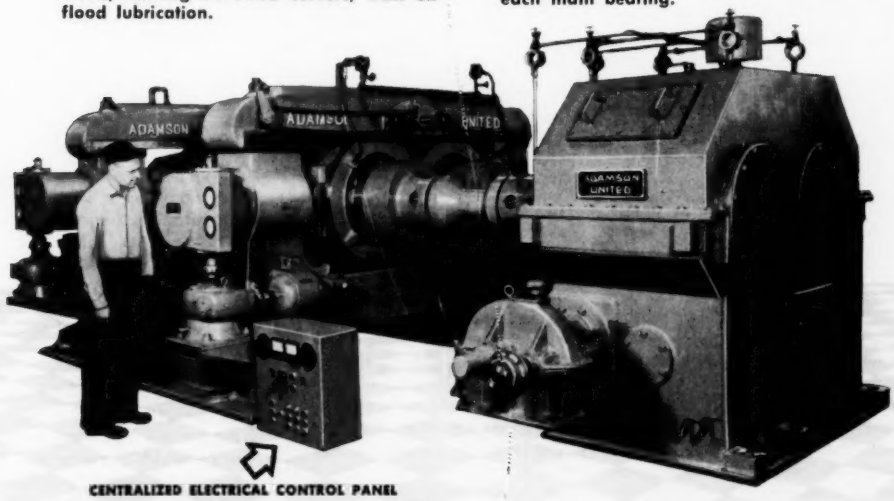

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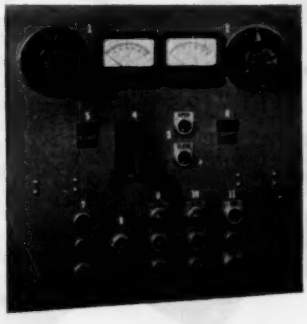

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PLASTICS DIGEST*

Abstracts from the world's literature of interest to those who make or use plastics or plastics products. Send requests for periodicals to the publishers listed.

General

CHEMICALS AND PLASTICS. F. H. Carman. Chem. Eng. News 29, 1719-21 (April 30, 1951). The effect of chemical supplies on the production of plastics and the critical uses for plastics are discussed.

THE QUARTERMASTER CORPS INTEREST IN PLASTICS. C. N. Gardner. SPE J. 7, 19-20 (May 1951). Items and materials ordered by the Quartermaster Corps are listed, and the proper addresses to write to for information are given.

Materials

POLYTHIOLESTERS. C. S. Marvel and A. Kotch. J. Am. Chem. Soc. 73, 1100-2 (Mar. 1951). Polythiolesters were prepared from a variety of dibasic acid chlorides and aliphatic dithiols. They were also prepared by the addition of dibasic thio acids to the non-conjugated diolefin biallyl. The polythiolesters thus far obtained are relatively low in molecular weight as judged by inherent viscosity, melt higher than oxygen analogs as a rule, show definite evidence of crystallinity in their X-ray patterns, and appear to be relatively stable to hydrolysis in distilled water.

BANBURY DISPERSION OF HIGH-STYRENE COPOLYMER RESINS WITH RUBBER. H. S. Sell and R. J. McCutcheon. Ind. Eng. Chem. 43, 1234-43 (May 1951). Reinforcement with high-styrene copolymer resins has become an integral part of rubber compounding. Although these resins impart many unique and desirable properties, their hard, horny characteristics present dispersion problems. This study investigated, under controlled Banbury conditions, factors that influence the ease of incorporation of these resins into rubber. The results of this study indicate that the following factors have a marked influence upon dispersion characteristics: heat softening point, flow characteristics, particle size of the resin, internal structure of the polymer, Banbury temperature, and cycle under which mixing is done. Desirable ranges for each of the properties are recommended, and the validity of the conclusions drawn is confirmed by a comparison of an "ideal polymer" with commercial polymers. The paper presents working data and evaluation procedures useful to the user of high-styrene reinforcing resins. It also presents a set of evaluation standards whereby the processability can be judged from the physical properties of the resin.

CELLULOSE ACETATE BUTYRATE MELT CASTING. C. J. Malm, O. W. Kaul, and G. H. Hiatt, Ind. Eng. Chem. 43, 1094-8 (May 1951). Heat stable compositions of high butyryl-type cellulose esters are described which can be simply melt cast at about 300° F. without the use of pressure or volatile solvents. Formulations with ester levels of 35 to 65% have good physical properties if the modifying agents are chosen to have good solvent power and yet impart strength and hardness. A mixture of plasticizer, resin, and wax gives satisfactory compositions when compounded with the cellulose ester. Plaster of paris, casting phenolic, metal, and rubber latex can be used in forming molds for the cellulose ester melt compositions. Rubber molds are of most interest because of their ease of handling and their reproduction of fine details and undercuts. These casting compositions and simple molds make feasible short production runs at a minimum cost. This process may also be found useful in foundry work when only a limited number of reproductions of the original pattern are needed.

PREPARATION OF FILMS FROM AMYLOSE. I. A. Wolff, H. A. Davis, J. E. Cluskey, L. J. Gundrum, and C. E. Rist. Ind. Eng. Chem. 43, 915-19 (Apr. 1951). In order to evaluate the potential utility of self-supporting films from amylose, the linear starch fraction, techniques were devised for the laboratory preparation and testing of such films. The physical characteristics, chemical resistance, and mechanical properties of the films were studied, including the relation of properties to film thickness, varying amounts of added amylopectin, molecular size of the amylose, heat treatment, and amounts of glycerol added as plasticizer. The general mechanical behavior of the films is good, most values of their properties lying within the range of common plastic films. Industrial applications can be expected if economical means are found for obtaining amylose either by starch fractionation or from starches of high amylose content. Amylose film should find unique applications in the food and pharmaceutical fields based on its digestibility and breakdown to sugars absorbable in animal body.

Testing

THE IZOD IMPACT TEST: A STUDY OF THE SOURCES OF VARIABILITY WHEN TESTING STYRENE AND OTHER PLASTIC MATERIALS BY ASTM D 256-47T, METHOD A. C. H. Adams. ASTM Bull. No. 173, 48-50 (Apr. 1951). The object of this investigation was to study the known sources of variability in the Izod impact method when testing styrene, cellulosic, and phenolic plastics. The variables studied were 1) vise-gripping pressure, 2) notch-cutting tool radius and magnification under which it is measured, 3) depth of material under the notch, 4) lathe on which the notching is done, and 5) molding conditions. Styrene plastic was the only material in which the effect of all of the above was studied. In the case of the phenolic and cellulosic plastics, vise-gripping pressure was the only variable studied. The conclusions reached, which refer to styrene plastic unless otherwise indicated, are as follows: 1) Vise-gripping pressure has a significant effect on the Izod impact strength of styrene plastic. It has little to no effect on phenolic (general-purpose, woodflour-filled) or cellulose acetate materials; 2) variation of the notch radius within the limits specified by ASTM D 256-47T has a significant effect on Izod impact strength, that is, larger radius causes higher apparent strength; 3) a magnification of at least 55 diameters is desirable to check the radii of cutting tools; 4) variation in

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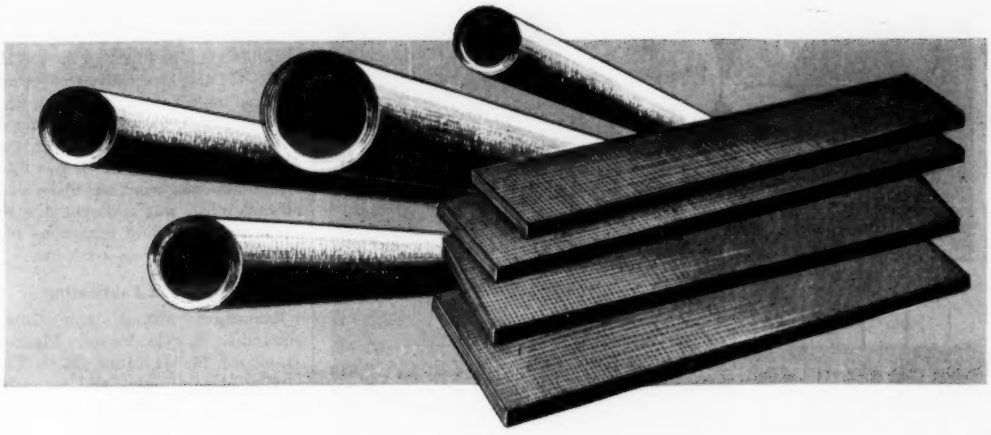

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the depth of material under the notch outside the limits specified by ASTM D 256-47T has a significant effect on the Izod impact strength, that is, decreased depth causes less apparent strength; 5) no significant effect was apparent due to the use of two different lathes for notching; 6) no significant effect was apparent due to variation in molding conditions for the ½ by ½-in. cross-sections.

Molding and Fabricating

EXTRUSION MIXING AND COMPOUNDING. E. G. Fisher. Plastics (London) *16*, 171 (June 1951). The mixing of polystyrene and colors in an extrusion machine is described.

MOLD SHRINKAGE OF THERMOPLASTIC MATERIALS. S. E. Glick. SPE J. *7*, 9-18 (May 1951). Variables which affect shrinkage of thermoplastic molded parts include gate size, material temperature, mold temperature, plunger dwell, fill time, and die block changes under stress. The magnitude of these effects is discussed for the common thermoplastic materials.

MOLD POLISHING WITH DIAMOND PASTE. P. Grodzinski. Plastics (London) *16*, 80 (Mar. 1951). Diamond dust is used as a polishing agent for finishing the surfaces of steel dies.

PHENOLICS FOR LARGE MOLDINGS. F. J. Donohue. SPE J. *7*, 26-8 (Feb. 1951). Problems concerned in molding large parts such as television cabinets are discussed.

Applications

LAMINATED GEARS FOR INDUSTRY. British Plastics *24*, 206-9 (June 1951). The manufacture of various types of gears from plastic laminates is described.

WOVEN P.V.C. FIBERS. Brit. Plastics *24*, 150-1 (May 1951). The properties of fibers made of polyvinyl chloride and clothing made from these fibers are described.

SEALED PACKAGES IN PLASTICS SHEETING. Brit. Plastics *24*, 144-5 (May 1951). The sealing of liquid and solid cosmetics, drugs, and detergents in packaging made from polyvinyl chloride and polyethylene film is described.

METAL-AND-PLASTICS IN PRODUCT DESIGN. J. Delmonte. Electrical Manuf. 47, 98-101, 254, 256, 258 (June 1951). Principles involved in

the use of metals and plastics in a product are discussed. Both materials may be enhanced by proper product design. Products which use both metals and plastics are described.

PROTECTIVE CLOTHING. Plastics (London) *16*, 115-18 (May 1951). The manufacture of gloves from polyvinyl chloride paste is described. Other protective clothing is made from fabric coated with polyvinyl chloride plastic.

Properties

BEHAVIOUR OF INSULATING MATERIALS AT RADIO FREQUENCIES. J. J. Chapman, J. W. Dzimianski, C. F. Miller and R. K. Witt. Electrical Manuf. *48*, 107-9, 236, 238 (July 1951). The electrical breakdown stress, dielectric constant, and dissipation factor of molded phenolic, phenolic laminate, melamine laminate, silicone laminate, polytetrafluoroethylene, polyethylene, and polystyrene plastics, ceramics, mica, and glass at frequencies from 60 cycles to 18 mc. are reported.

RELATION OF TENSILE STRENGTH TO BRITTLE TEMPERATURE IN PLASTICIZED POLYMERS. R. F. Boyer. J. Applied Phys. *22*, 723-9 (June 1951). Since both the second-order transition temperature and the tensile strength of plasticized polymers decrease linearly with plasticized content, and frequently in inverse proportion to the molecular weight of the plasticizer, it was predicted that a linear relationship should exist between tensile strength and transition temperature for plasticized polymers, independent of the nature of the plasticizer. Tensile strength versus heat distortion for four different plasticizers in polystyrene follows this prediction very well. However, tensile strength versus brittle temperature for plasticized Vinylite VYNW gives a different straight line for each plasticizer. It is suggested that the diffusion rate of a plasticizer molecule is important in the fast brittle point test. The hypothesis is proposed that the brittle temperature of a plasticized polymer represents an isodiffusion constant state. It follows on the basis of some semi-empirical equations that the brittle temperature should decrease linearly with plasticizer content, and inversely as the activation energy for diffusion of the plasticizer molecule in the plasticized polymer. This

latter prediction appears in accord with existing data. This diffusion concept allows one to predict that the brittle temperature should increase linearly with logarithm of frequency of the test, but inversely as the activation energy for diffusion.

SEDIMENTATION EQUILIBRIUM IN CONCENTRATED POLYMER SOLUTIONS. M. Wales. J. Applied Phys. *22*, 735-9 (June 1951). It is shown that sedimentation equilibrium can be obtained in polymer solutions of concentration as high as 20% by weight. This equilibrium is approached from both sides, with identical results. The virial coefficients for the osmotic pressure may be calculated from experiments of this kind. The results are in good agreement with the osmotic pressure data of other investigators for polystyrene in butanone and polyvinyl acetate in butanone.

OUTDOOR WEATHER AGING OF PLASTICS UNDER VARIOUS CLIMATOLOGICAL CONDITIONS. S. E. Yustein, R. R. Winans, and H. J. Stark. ASTM Bull. No. 173, 31-43 (Apr. 1951). The effects of outdoor weather aging under widely different climates were investigated for various types of plastic materials. Five climatological regions are represented in the program which provides for outdoor exposures on sites located in: 1) Panama Canal Zone (tropical); 2) New Mexico (dry desert); 3) New York Naval Shipyard (temperate); 4) Fort Churchill, Manitoba, Canada (subarctic); and 5) Point Barrow, Alaska (arctic). The report covers exposures for 1, 3, 7, and 12 months. Subsequent reports will cover 18-, 24-, 30-, and 36-month exposures. The materials dealt with include five types of clear transparent sheet plastics, six types of laminated materials, and five types of molded terminal bars. The sheet materials were evaluated after each period of exposure for tensile and flexural properties, hardness, and dielectric constant and power factor. The electrical properties were determined for frequencies of 60, 1000, and 10^6 cycles. The transparent materials were evaluated also for light transmission and haze. The molded terminal bars were evaluated for insulation resistance, dielectric strength, and high-impact shock resistance. On the basis of the extensive data accumulated at the completion of the first year's ex-

posure, it is possible to deduce the occurrence of a variety of effects that appear to be related to differences in the climatic and environmental conditions and in the exposure periods.

SIMPLE METHYLOL DETERMINATION. R. W. Martin. Anal. Chem. *23*, 883-4 (June 1951). The reaction of phenol alcohols and similar materials containing methylol groups with an excess of phenol gives one mole of water for each methylol group. When benzene is added to the phenol containing the sample and refluxed, the water formed by reaction of the methylol groups with the phenol distills as a benzene-water azeotrope. The water is collected as a separate phase in a calibrated Bidwell and Sterling trap, where it is measured to give an estimate of the methylol content of the sample. The method not only provides a simple procedure for determination of the methylol content of a variety of compounds, but makes possible a more systematic study of condensation polymers based on formaldehyde and phenol, urea, and melamine.

COLORIMETRIC DETERMINATION OF ROSIN AND ROSIN ESTERS. M. H. Swann. Anal. Chem. *23*, 885-8 (June 1951). A method is described for determining the type and quantity of rosin derivatives in mixtures of resinous products.

STUDY OF BONDED UNITS. J. M. Buist, C. H. Lindsey, W. J. S. Naunton, R. L. Stafford, and G. E. Williams. Ind. Eng. Chem. *43*, 373-81 (Feb. 1951). A method is described for evaluating the bond between rubber and metal, and test results are reported. The volume of the rubber is an important factor. A method for measuring the tear strength of rubber is also described.

ADHESION OF POLYETHYLENE AND POLYSTYRENE TO STEEL. G. Kraus and J. E. Manson. J. Polymer Sci. *6*, 625-31 (May 1951). A conservative estimate of the molecular forces involved in the adhesion of polymers to conducting surfaces leads to bond tensile strengths considerably above those realizable in practice. This is explained by the occurrence of flaws, thermal stresses, and deformation under load. In order to minimize these factors, very thin films of polystyrene and polyethylene were molded between steel cylinders, and experimental conditions were care-

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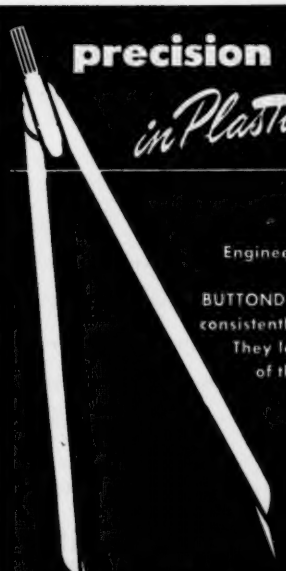

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INFLUENCE OF MOLECULAR WEIGHT ON THE PROPERTIES OF POLYSTYRENE. E. H. Merz, L. E. Nielsen, and R. Buchdahl. Ind. Eng. Chem. *43*, 1396-1401 (June 1951). Tensile strength, modulus and elongation, dynamic modulus, dissipation factor, tensile heat distortion, dynamic heat distortion, and second order transition temperature of polystyrene vary with molecular weight according to the relation: property $A = B/\overline{M}_n$, where A and B are constants and $\overline{M}_n$ is the number average molecular weight. The film formability depends on $\overline{M}_n$, the weight average molecular weight. If both $\overline{M}_n$ and $\overline{M}_w$ for a particular polystyrene specimen are above their respective limiting values, then the shape of the distribution curve does not affect the physical properties. These results show that the physical properties of commercial polystyrenes are mainly controlled by the amount of very low molecular weight species present.

PROPERTIES OF THREE CAST POLYESTER RESINS—SIERRACIN 212, 212A, AND 250A. G. M. Kline. National Advisory Committee for Aeronautics Research Memorandum 51B23. Nine pages. (Apr. 23, 1951). Physical properties of samples of three cast polyester resins known as Sierracin resins were investigated. Tests were made to determine specific gravity, index of refraction, Rockwell hardness, Tukon indentation hardness, effect of exposure to accelerated and outdoor weathering, Munsell color, resistance to accelerated service tests, crazing resistance under stress, flexural strength, Izod impact strength, and Taber abrasion resistance. Tables of the values obtained for these physical properties are included in the report.

APPLICATION OF X-RAY DIFFRACTION METHODS TO THE IDENTIFICATION OF NATURAL AND SYNTHETIC RUBBERS. S. Goldspiel and F. Bernstein. ASTM Bull. No. 171, 71-80 (Jan. 1951). X-ray diffraction patterns

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and data for rubber compounding ingredients are presented and applied to the identification of major crystalline ingredients in several basic rubber stock types. Methods for the identification of natural and synthetic elastomers by low-temperature aging or stretching using film techniques are described. The extension of such methods to the Geiger counter X-ray spectrometer is presented.

Chemistry

COPOLYMERIZATION. S. H. Pinner. Brit. Plastics *24*, 152-62 (May 1951). The basic features of copolymerization theory are reviewed. 28 references.

POLYMERIZATION OF ALLYL COMPOUNDS. V. INHIBITION BY NITRO COMPOUNDS. G. S. Hammond and P. D. Bartlett. J. Polymer Sci. *6*, 617-24 (May 1951). The effect of various nitro compounds on the peroxide-induced short-chain polymerization of allyl acetate was investigated. Of the compounds studied, sym-trinitrobenzene is the most active as a retarder. Nitromethane and dinitrodurene were less effective than aromatic nitro compounds which have replaceable nuclear hydrogen atoms, but both exerted a measurable retarding influence on the polymerization reaction. Trinitrobenzene reacts with a minimum of 5.9 radicals per molecule. This and other data are discussed in connection with the hypothesis that radicals react by an alkylation mechanism. An alternative mechanism involving attack on the nitro group itself is suggested.

ELECTROLYTIC INITIATION OF POLYMERIZATION. I. M. Kolthoff and L. L. Ferstandig. J. Polymer Sci. *6*, 563-74 (May 1951). Two new principles are discussed by which polymerization may be initiated electrolytically. One of these methods, the continuous electrolytic formation of the activator in a redox activation polymerization system, under various conditions, was used successfully in the polymerization of acrylonitrile, but not of isoprene or styrene. The second method, based on the formation of free radicals in the electrolytic reduction of perdioxy compounds, was tested under a limited number of conditions without significant success. Emulsion systems also were employed in this research and the results are discussed.

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INJECTION MOLDING MACHINES—Series 600T, consisting of a 24- and a 32-oz. injection molding machine, has been introduced by Reed-Prentice Corp. (Dept. D), 677 Cambridge St., Worcester 4, Mass. The machines, with a new rugged tie-bar construction, offer molding advantages over frame-type units in these capacities.

Reed-Prentice's new 24-oz. unit will plasticize 125 lb. of thermoplastic material per hour, while the 32-oz. equipment is capable of 150 lb. per hour. Both machines incorporate a new mold locking mechanism that develops 600 tons clamping pressure and provides a full 24-in. stroke that can be shortened for thin molds. Movement of the link mechanism through four motor-driven nuts on the tie bars affords easy and accurate adjustments.

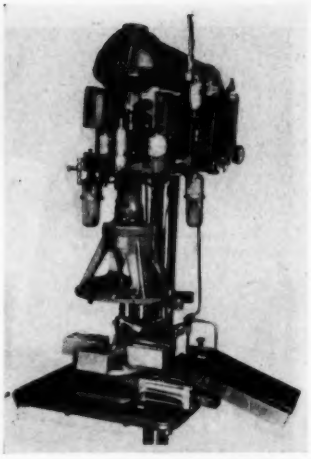
A central control panel at the front of each machine controls movement of die plate and plunger. Die platen area has been increased to 45 by 54 in. to accommodate larger molds and provide greater casting area of 300 sq. inches. Movable die plate slides on four 6-in. diameter tie bars. Plates are so arranged that automatic ejection is provided both at the center and at the four corners.

A large-capacity heating cylinder, incorporating a copper core spreader for rapid plasticizing, is mounted on vertical ways to permit easy removal. Hydraulic and electric interlocks for the front safety door assure safe operation.

AUTOMATIC SPRAY PAINTER—Flexible regulation of the length, time, speed, and amount of paint spray enables a new automatic spray painting machine to handle a wide variety of small parts on a mass production basis. A product of Conforming Matrix Corp., 364 Toledo Factories Building, Toledo 2, Ohio, the machine is air operated and hydraulically controlled.

Parts to be treated can be wet painted, one color right after another. Spraying is accomplished from underneath against readily interchangeable electro-formed metal masks which require less frequent cleaning because surplus spray falls away. Rapidity of painting can be adjusted to suit individual demands; rates up to 3600 pieces per hr. are possible.

TAPPING-DRILLING MACHINES—High production tapping and drilling machines equipped with automatic, air-controlled single- or multiple-spindle heads and index tables are now being manufactured by Beckett-Harcum Co., 1140 Wayne Rd., Wilmington, Ohio. Multiple tapping can be performed directly from a drill head without lead screws or clutches. Class 2 and 3 fits can be obtained in soft plastics and very soft metals, as well as in certain steels.



Tapping-drilling machine is equipped with single or multiple spindle heads

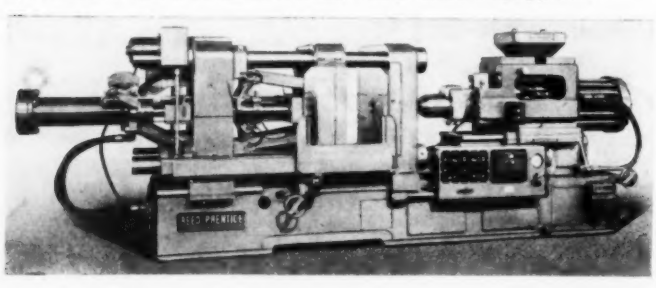
Multiple tapping is accomplished with a special high-reversal motor which reverses the taps when they reach accurately controlled depths. By reversing the motor, taps lead out without stripping the last thread. Simple adjustments permit interchange of fixtures for both drilling and tapping.

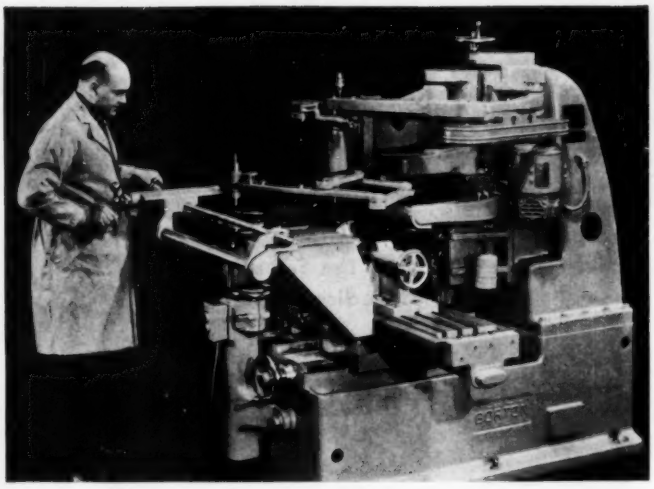
Speed of the forward and return spindle stroke is infinitely variable. A hydraulic break-through cushion is provided for controlling break-through in drilling uneven surfaces. In drilling, any desired pressure up to 1250 lb. can be obtained using a 100-lb. air line.

PANTOGRAPHIC ROLL ENGRAVER—Accurate milling, routing, and engraving completely around cylinders and rolls is achieved by a newly designed pantograph machine produced by George Gorton Machine Co., 1110 W. 13th St., Racine, Wis. The equipment is applicable to any process where rolls are used to press, print, stamp, emboss, deboss, and die-cut an extensive variety of materials.

A major advantage claimed for Gorton's Pantographic Roll Engraver is that modifications of various machine components can be easily made to meet a wide range of requirements regarding ratio of reduction, range, and roll diameter. The unit accommodates rolls from 6

Injection machine, made in 24- and 32-oz. models, develops 600-ton clamping pressure





Pantograph unit is capable of milling, routing, and engraving completely around rolls

to 12 in. in diameter and up to 40 in. long.

Work is held between centers as on a lathe. Forward and backward movement of the tracer automatically rotates the roll; longitudinal motion does not rotate the roll. Thus, the cutter point is always centered over the axis of the work piece. Maximum area covered by the cutter at one setting is 5 by 20 inches.

A master pattern is cut in either sunk or relief form and twice desired size. Only a small segment of the entire design is required if it is to be repeated all around the roll. Repeating the design segment of the master is accomplished by indexing the work piece through a simple adjustment of the headstock drum as each segment is completed. This permits all milling, routing, or engraving to be done without removing the work piece.

The pantograph is built without gears. Correct speed of rotation is provided by an integral compensating mechanism easily set for each roll diameter. Infinitely variable spindle speeds range from 500 to 12,000 rpm.

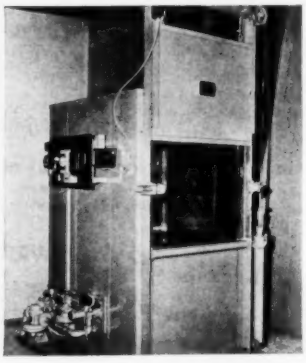
SANDER AND GRINDER—A tilting spindle instead of a tilting table is said to be one of the major exclusive features of the Master Spindle Sander and Grinder developed for plastics, metal, and wood by Kindt-Collins Co., 12653 Elmwood Ave., Cleveland 11, Ohio. Parts sanded or ground on this machine are always in a horizontal position; the spindle, however, can be inclined from 0 to 45° by a worm and gear unit, and can be securely locked in any desired position. The spindle can be used oscillating or non-oscillating.

Another highlight is the core box attachment which produces straight and tapered core boxes mechanically, eliminating tedious handwork and materially reducing time involved. Other features include a 2-hp. motor with speeds of either 2000 or 4000 rpm.; adaptability of abrasive sleeves from ¼ to 4 in. in

Sander and grinder has tilting spindle

diameter and 6 to 11 in. in length; and grinding wheels up to 5 in. in diameter and 5 in. high.

GLASS FIBER PREFORM OVEN—An oven designed for use in connection with manufacture of glass fiber-reinforced plastics products is being made by The Lanly Co., 750 Prospect Ave., Cleveland 15, Ohio. The oven is heated by forced air at temperatures up to 400° F. Its action has the combined effect of removing



Preform oven is used for plastic products having glass fiber reinforcement

moisture from the articles being processed, and of producing a bond between the plastic and the glass fiber-reinforcing members.

PUMPS—Three new heavy-duty Type HG axial rolling piston pumps have been introduced by The Oilgear Co., 1576A W. Pierce St., Milwaukee 4, Wis. The three models, designated HG-530, HG-830, and HG-850, are capable of speeds up to 1800 rpm., and can produce maximum pressures up to 3000 and 5000 p.s.i. They are of the fixed-stroke type, the volume of oil delivered varying with drive shaft speed. Oil is delivered in one direction. Each model consists of an axial rolling piston pump, a supercharging gear pump, a gear pump relief valve, and an adjustable reverse-flow type high pressure relief valve. Oilgear's constant delivery pumps are designed mainly for pushing, pulling, lifting, and lowering, and for maintaining high static loads on large clamping rams and similar equipment. About 135 c.i.p.m. excess gear pump oil at 100 p.s.i. is available for auxiliary purposes.

BOOKS AND BOOKLETS

Write for these publications to the companies listed. Unless otherwise specified, they will be sent gratis to executives who request them on business stationery.

"Advances in Colloid Science, Vol. III" edited by H. Mark and E. J. W. Verwey.

Published in 1950 by Interscience Publishers, Inc. 215 Fourth Avenue, New York 3, N. Y. 384 pages. Price $7.50.

This edition differs from the second edition in that it covers a series of topics, instead of a field of special interest. It attempts to give an approximate cross section view of colloids through those branches of the science that have grown rapidly or shown unexpected development during the last few years. Nine contributing authors, all specialists in colloid science, have contributed papers to the book.

"The Practical Engineer Pocket Book, 1951". Edited by N. P. W. Moore.

Published by Pitman Publishing Corp., 2 W. 45th St., New York, N. Y. 744 pages. Price $3.00.

The 63rd edition of this pocket dictionary has been greatly expanded to include information on the properties of compression ignition engine fuels and on the supercharging of engines. The list of technical journals has been revised to include a selected list of American publications, and a German dictionary of engineering terms has been added to supplement the French and Spanish dictionaries which appeared in previous editions. The book includes chapters on metallurgy, steam generation, air compressors, hydraulics, machine tools and lubrication, and condensers.

"Organic Reagents for Organic Analysis" by the staff of Hopkins and Williams Research Laboratory.

Published in 1950 by Chemical Publishing Co., Inc., 26 Court St., Brooklyn, N. Y. 224 pages. Price $5.00.

The second, enlarged edition of this book contains over 100 pages on important new developments in organic analysis which did not appear in the first edition. The first section of the book gives the major classes of organic compounds with a list of selected reagents. The second part of the book contains a discussion of the selected reagents, and lists the groups of organic compounds for whose identification the reagent is used together with the methods of preparation. The third section consists of alphabetically arranged melting point tables of derivatives of hundreds of organic compounds.

"Sales and Business Forecasting in Chemical Process Industries," by R. S. Aries and W. Copulsky.

Published in 1950 by Chemonomics, Inc., 400 Madison Ave., New York, N. Y. 135 pages. Price $5.00.

Methods, advantages, and specific application of forecasting in chemical process industries are discussed. Methods used by government agencies and private industry are described. Individual chapters deal with forecasting as a science, general objectives, extent of forecasting, recommended methods for specific problems, and organization of forecasting departments.

Taylor technology—The centennial issue of the company's external house organ summarizes in 40 pages the historical background of the firm, its manufacturing facilities, and the markets it serves. Pictorially and editorially, the chapters cover research, design, and development; manufacturing facilities; quality control and inspection; extent of markets; and products for home and industry. *Taylor Instrument Companies, 95 Ames St., Rochester, 1, N.Y.*

Plexiglas sign manual—Many technical questions encountered in the construction, lighting, and fabrication of custom Plexiglas signs are answered in a 76-page manual which is organized into four sections for easy reference. General information includes fundamental facts about the material, particular types recommended for certain applications, physical properties of colored, colorless, and corrugated Plexiglas sheets, and some important considerations in sign design. The construction section shows installation details with the aid of pictures and sketches. Fabrication of Plexiglas covers cutting, drilling, forming, cementing, and waxing the material. The section on sign lighting discusses incandescent lighting, translucent letters on backlighted Plexiglas panels, and formed letter lighting. *Rohm & Haas Co., Washington Square, Philadelphia 5, Pa.*

Stabilizer handbook—Formerly published as the Stabilizer Data Book, this new 38-page booklet has been revised, re-edited, and brought up to date. Contents include sections on the practical aspects of vinyl stabilization, optimum stabilizer combinations for calendered, plastisol and organosol, and coating resins, product data on the firm's stabilizers, technical bulletins, and a list of the company's sales agents. *Ferro Chemical Corp., P.O. Box 349, Bedford, Ohio.*

Polymer science and engineering—Results of investigations, carried on by the Princeton University Plastics Laboratory, are reported under four categories: mechanical; electrical; new or improved materials; and high polymer. In each category are listed pertinent Technical Reports, all contained in the Bibliography of Technical Reports, May 1951 issue, available for 50¢ from *Office of Technical Services, U. S. Dept. of Commerce, Washington 25, D. C.*

Translations of Russian chemical journals—An extensive cross-index to the English translation of the *Journal of General Chemistry of the U.S.S.R.* (Vol. 19, 1949), has been published. It contains four sections: 1) titles of papers, listed in sequence of appearance in the journal; 2) author index, arranged alphabetically; 3) subject index, arranged alphabetically; and 4) index to organic compounds, arranged according to empirical formula. Price to non-subscribers $2.50. *Consultants Bureau, 151 W. 42nd St., New York 18, N.Y.*

Polyethylene for paper coatings—This illustrated 32-page booklet is a review of the manufacture, properties, and applications of polyethy-

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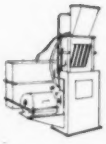

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lene-coated paper. It contains considerable technical data on the chemical and physical properties of polyethylene films. It describes the various methods of coating paper, such as the extrusion-lamination process which is outlined in greater detail than other methods because of its newness. This booklet also contains a complete and detailed description of the extrusion of polyethylene film. In addition, this booklet presents technical data on polyethylene resins through text, tables, and graphs, especially treating such subjects as chemical resistance, permeability, solubility, and compatibility. *Bakelite Co., Div. of Union Carbide and Carbon Corp., 30 E. 42nd St., New York 17, N.Y.*

Styrene literature—Two bulletins covering different aspects of Lustrex styrene molding have been prepared by this company. Cementing techniques are described in a 13-page booklet issued by the Plastics Div., which includes information on types of cements, cement viscosity, methods of application, as well as the bonding of styrene to styrene, styrene to non-porous surfaces, and styrene to such porous surfaces as paper, wood and cork. The second bulletin, from Merrimac Div., Everett, Mass., describes lacquers for molded styrene and cellulose acetate. Several coatings are discussed which have been formulated to give excellent adhesion, non-crazing, and opacity with a single coat application. Charts give method of application, gloss, and other properties. *Monsanto Chemical Co., Springfield, Mass.*

Wet-blasting—Newly developed compact wet-blasting units with no moving parts, designed for high production rate deburring, descaling, stock removal and general surface finishing, are illustrated in a four-page folder. The wet-blasting process, as incorporated by these self-contained units is fundamentally based on the high-velocity transfer of a fine abrasive suspended in water through a siphon jet gun and against the work. The units described are: a standard unit for general surface finishing and cleaning; a Roto-Barrel unit for high production work in bulk; a junior unit for surface finishing procedures in smaller installations; and a roll-table unit for

heavy molds and dies. *The Cro-Plate Co., Inc., 747 Windsor St., Hartford 5, Conn.*

Processing gloves—Methods of processing canvas and cotton knit gloves by impregnating with natural rubber, neoprene, or plastics materials is contained in a four-page folder. Gloves processed in this manner have a wide variety of industrial uses. *American Rubberizing Co., 617 - 11th Ave., S., Minneapolis 4, Minn.*

Mastic flooring underlayments—A four-page folder gives information on asphalt- and rubber-type flooring underlayments, which are used to provide a smooth, level base, resistance to shock, and moisture resistance for installation of decorative floor coverings. Composition and mixtures for asphalt emulsion and rubber latex binders are described together with recommended practice in application. *Industrial Products Div., The Flintkote Co., Inc., 30 Rockefeller Plaza, New York 20, N.Y.*

Reference chart—A revised reference chart lists the various types of driers, stabilizers, plasticizers, paint specialties, tackifiers, wood preservatives, and emulsifiers that are available from this company. Descriptions for each product give specifications, applications, formulations, and other laboratory data *Advance Solvents & Chemical Corp., 245 Fifth Ave., New York 16, N.Y.*

Power tools—Illustrated and fully described in a 48-page catalog are the company's line of power tools for cutting, shaping, drilling, and finishing wood, metal, fiber, and plastics. Equipment discussed includes jointers, planers, band saws, contour and jig saws, drill presses, band filers, grinders, belt and spindle sanders, shapers, tilting-arbor saws, and saw jointers. *Boice-Crane Co., 972 Central Ave., Toledo, Ohio.*

Geon resin 404 (Service Bulletin G-6)—The company's new Geon Resin 404 made without plasticizer, which has greatly extended the application of polyvinyl chloride resins in the rigid and structural fields, is discussed in a 12-page bulletin. The literature outlines some of the principal applications already proved

practical, the physical properties, and contains graphs on tensile and flexural strengths, modulus of elasticity, heat distortion temperatures, stiffness, and impact and chemical resistance. The resin can be processed on conventional plastics equipment and can be calendered, extruded, transfer molded, deep drawn, or vacuum formed into rigid products. Suggested starting recipes for calendering, extrusion and molding, and wire insulation are given. *B. F. Goodrich Chemical Co., 324 Rose Bldg., Cleveland, Ohio.*

Steam traps—The company's line of steam traps for power plants, steam distribution systems, steam processes, and marine service is discussed in a 24-page booklet, which contains application diagrams, typical installation and operating suggestions, construction details, and a capacity chart. *Yarnall-Waring Co., Chestnut Hill, Philadelphia 18, Pa.*

Precision plastic molding—The history of this company—now observing its 75th anniversary—from its beginnings as a small button factory to its present position as a molder of parts for industry, is contained in a four-page folder. Illustrated are the firm's facilities for compression, transfer, and injection molding; automatic rotary molding for mass production; extrusion; and producing reinforced plastics. Present plant equipment is listed, together with some of the items produced during World War II. *Auburn Button Works, Inc., Auburn, N.Y.*

Catalytic fume combustion for industry—A recently developed process of catalytic fume combustion which oxidizes the combustible fumes liberated in the manufacture of some plastics is explained in an eight-page booklet. Unless thoroughly oxidized, the fumes—phenol, hydrocarbon, and other similar types—are irritating to the factory worker and may be a source of air pollution. The booklet discusses the principles of operation of the new process, the construction of the catalyst element, and its application. *Catalytic Combustion Corp., 4544 Grand River Ave., Detroit 8, Mich.*

Packaging in barrier-type containers—Information pertaining to packaging in barrier-type pouches, envelopes, and blankets to meet government specifications is outlined in a new book. These packaging materials consist of an inner heat sealing film laminated to one or more outer layers of non-heat sealing film. The multiple-layer construction of the material insures maximum protection in flexible containers, and is now a requirement of government specifications. *Amsco Packaging Machinery, Inc., 31-31 48th Ave., Long Island City 1, N.Y.*

Machine tools (Catalog No. M-1712)—The company's complete line of equipment is set forth in this 48-page booklet with specifications and pictures. Included is equipment for milling, die sinking, broaching, cutting and grinding, lapping, and flame hardening, and data on cutting fluid. A list of sales agents is provided. *The Cincinnati Milling Machine Co., Cincinnati 9, Ohio.*

Drycol—Procedure for using Drycol, a colorant for plastics, is given in a six-page folder, together with information on standard and metallic colors, special effects, and colors for

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polyethylene. *Gerina Products, Inc., Kenilworth, N.J.*

The story of research—Another in the series, "This is Du Pont," this 28-page booklet is designed to show the significance of industrial research and its influence on the American standard of living. The booklet illustrates complex new research tools and equipment, the scope of research activities, testing of research developments, and concludes with a calendar of research achievements, among them such synthetic materials as Lucite, Alathon, Orlon, neoprene, and Dacron, a new polyester fiber. *E. I. du Pont de Nemours & Co., Inc., Wilmington, Del.*

Nylon and Teflon—Specifications and sizes for nylon and Teflon in rod, strip, and tubing forms are contained in this new folder. The two materials are used in the electrical manufacturing, metal-working, and chemical fields for machined or blanked parts. Applications of nylon formulations, which require wear resistance and toughness, include low frequency insulation, valve seats, thrust washers, gears, bearings, and other applications where normal lubrication is impossible. The folder lists the physical characteristics that enable Teflon to withstand the attack of almost all chemicals except molten alkali metals. Recommended uses for Teflon include valve and pump packing, seats, washers, gaskets, high frequency spacers and insulators, coil forms, and tube sockets. *The Polymer Corp. of Pennsylvania, Reading, Pa.*

Plastic preforming (Cat. No. 509)—The advantages of preforming plastic parts and the conditions under which preforming is necessary are explained in a recently published 18-page booklet. Merits listed for preforms include more accurate and less wasteful loading of molds and speedier plunger molding because preforms heat more rapidly. The catalog gives the properties of preforms, methods of preforming, punches and dies used in the process, and specifications and pictures of many preform presses manufactured by the company. Sizes and shapes of preforms best suited to specific products are listed, along with recommended methods for handling raw plastics and preforms. *F. J. Stokes Machine Co., 5900 Tabor Rd., Philadelphia 20, Pa.*

Engineering data on polyethylene—Two eight-page folders present engineering data on the company's Agilene polyethylene. One folder on polyethylene containers illustrates and describes fabricated rigid bottles and jars and safety jugs for storage and transportation of corrosive chemicals. The second folder covers the mechanical, electrical, thermal, and chemical properties of polyethylene, and includes practical data on the fabrication of equipment parts and pipe line assemblies made from polyethylene. *Plastics Div., American Agile Corp., 5806 Hough Ave., Cleveland 3, Ohio.*

Insulating materials and industrial laminates—An 11-page booklet presents information on insulating varnishes, sealing and filling compounds, varnished cloth and tapes, silicone insulation, mica insulation, and laminated plastics. *Chemical Dept., General Electric Co., Pittsfield, Mass.*

INTERNATIONAL PLASTICS NEWS*

Activities Around the World of Interest and Importance to the Plastics Industry in the United States

Visit to Scandinavia — David Rosenstein, president of Ideal Toy Corp. and of the National Association of Doll Manufacturers, is officially representing the National Federation of Settlements in the U.S. on a tour of Scandinavia, where he is making a survey of social settlement houses and neighborhood centers. He will make a report, on his return to this country, on current developments in the cooperative movement, industrial and labor relations, and social legislation.

Polyethylene water pipe—Conduit piping made of polyethylene is being used to transport drinking water in the province of Zeeland, Holland. This is the first instance of the use of plastics for this purpose in Holland, and is part of the reconstruction program being conducted in an area badly damaged during World War II.

The piping, manufactured by Holland Insulated Wire & Cable Works Ltd., Amsterdam, is furnished in rolls of continuous lengths. The polyethylene conduit is easily laid by unwinding it like cable; its installation is further simplified by its light weight.

An example of one application in this area was the connection of a farm to a local waterworks by polyethylene piping over a distance of 1800 feet. One of the pipes supplied to the waterworks was a 5100-ft. length of 1-in. diameter polyethylene wound on a single reel.

Modern rubber and plastic plant—A new British production unit at Brynmawr, South Wales, for the manufacture of molded rubber and plastic goods, began operation in July. The plant is manufacturing shoe soles and heels, flooring, grommets for automobiles, pedal rubbers for bicycles, special moldings for engineering customers, insulating tape, latex rubber gloves, and thin rubber and plastic sheeting.

The factory, which was sponsored by the Board of Trade and erected for Brynmawr Rubber Ltd., a sub-

* Reg. U. S. Pat. office.

Left: Polyethylene pipe is attached to water mains with standard metal couplings. Right: Laying of plastic pipe conduit system is made easy by light weight and continuous lengths

sidiary of Enfield Cables Ltd., was built entirely of reinforced concrete. Nine shell concrete domes cover the main production area; each are 95½ ft. long and 75½ ft. wide, and are the largest built so far in the world. The total working area is 250,000 sq. feet. A model of the Brynmawr plant was on display at the Festival of Britain.

Agreement on laminates—A technical aid agreement has been signed by Panelyte Div., St. Regis Paper Co., with H. Rommler, A. G., Mannheim, Germany, covering the manufacture and sale of decorative and industrial laminated plastics in the western zone of Germany. Previous agreements had been signed with three plastics manufacturers in England, France, and Sweden. Under the agreement, the German firm has access to Panelyte patents, machinery designs, and formulas for production of the various plastics grades, as well as technical information pertaining to new inventions, improvements, and other developments of the American company. As a reciprocal arrangement, Panelyte is entitled to information on plastics developments abroad.

Panelyte has also announced that Pan-American Sales, Inc., Havana, Cuba, has been appointed sales agent to sell the company's entire line of decorative and industrial grades, including high pressure laminates, injection molded pieces, fabricated parts, and specialties.

Molder in Israel—A new Israeli molding plant at Ramat Gan, Dura Plastic Injection Moulders Ltd., has been producing dishes and bowls, cups and glasses, kitchen items, and toys which are being marketed in all of Israel's cities. The plant, which started production in June 1950, was founded in 1949 by Samuel Dubiner, president of Toys and Games, Ltd., Toronto, Canada, and Alexander Ralphaeli of New York. The company was started with a registered capital of 350,000 Israeli pounds ($980,000), and the cooperation of the government's Investment Center. The company took over an existing factory, imported machinery and experts, and trained local workers. In addition to plastic items, the plant also manufactures its own dies and tools, and is planning to make injection molding machines.

Production of

FOR the purpose of this report, production is the sum of the quantities of materials produced for consumption in the producing plant for transfer to other plants

PLASTICS AND SYNTHETIC RESIN PRODUCTION
From Statistics Compiled

Materials	*Total p'd'n. first 5 mos. 1951*	*Total sales first 5 mos. 1951*
CELLULOSE PLASTICS:[a]		
Cellulose acetate and mixed ester plastics:		
Sheets, under 0.003 gage	6,702,425	6,610,540
0.003 gage and over	5,368,314	5,357,829
All other sheets, rods and tubes	2,813,594	2,705,882
Molding, extrusion materials	32,028,298	29,978,149
Nitrocellulose:		
Sheets	3,119,944	2,733,645
Rods and tubes	505,645	537,858
Other cellulose plastics[b]	5,838,181	5,623,466
PHENOLIC AND OTHER TAR ACID RESINS:		
Laminating	36,111,070	25,122,290
Adhesives	18,383,728	16,469,409
Molding and casting materials[a]	101,667,114	90,607,961
Protective coatings (unmodified and modified except by rosin)	11,052,780	8,114,090
Miscellaneous uses	32,970,359	32,068,147
UREA AND MELAMINE RESINS:		
Adhesives	40,685,946	38,337,755
Textile-treating resins	12,359,243	10,047,614
Paper-treating resins	6,725,648	6,200,770
Protective coatings, modified and unmodified	13,981,169	9,918,453
Miscellaneous uses, including laminating and molding[c]	39,272,115	34,578,774
STYRENE RESINS:		
Molding materials[a]	99,726,429	97,040,902
Protective coatings, modified and unmodified	17,790,427	17,218,143
Miscellaneous uses	24,480,185	22,123,635
VINYL RESINS:[d] Total	184,390,456	172,926,946
Sheeting and film (resin content)[e]		71,689,981
Adhesives (resin content)		5,012,565
Textile and paper-treating resins (resin content)[f]		18,657,924
Molding and extrusion materials (resin content)		57,439,200
Protective coatings (resin content)		11,775,168
Miscellaneous uses (resin content)		8,312,108
COUMARONE-INDENE AND PETROLEUM POLYMER RESINS:	73,655,541	73,011,407
MISCELLANEOUS SYNTHETIC PLASTICS AND RESIN MATERIALS:		
Molding materials[a, g]	32,334,920	29,376,390
Protective coatings[a]	7,900,465	9,327,684
All other uses[†]	44,951,767	42,863,146

[a] Dry basis unless otherwise specified. [†] Revised. [b] Includes fillers, plasticizers, and extenders. [c] Includes sheets, rods, and tubes, and molding and extrusion materials. [d] Data on resins for laminating and miscellaneous uses are on a dry basis; data on molding materials are on the basis of total weight. [e] Production statistics by uses are not representative, as end-use may not be known at the time of manufacture. Therefore, only statistics on

Plastics Materials

of the same company, and for sale. Sales include only the quantities involved in bona fide sales in which title passes to the purchaser.

IN POUNDS[a] FOR APRIL AND MAY, 1951 by U. S. Tariff Commission

April 1951		*May 1951*	
Production	*Sales*	*Production*	*Sales*
1,525,945	1,451,662	1,281,868	1,327,764
1,089,146	1,084,423	1,113,559	1,082,284
645,634	635,431	499,158	483,286
6,707,158	6,002,078	6,099,795	5,909,966
594,993	534,484	644,898	499,099
99,979	95,306	81,290	83,360
1,043,708	1,084,968	1,152,078	972,589
7,288,022[†]	5,142,969[†]	7,458,897	5,232,212
3,557,501[†]	2,988,979[†]	3,904,580	3,313,651
19,792,143	17,646,890	20,880,130	18,905,784
2,569,484	1,824,509	2,222,165	1,665,866
6,948,601[†]	6,672,838[†]	7,048,763	6,631,441
9,341,162[†]	7,709,068[†]	6,295,073	6,687,394
3,032,601[†]	2,033,907[†]	2,071,448	1,327,797
1,536,434	1,291,261	1,275,139	1,280,168
2,885,462	1,769,507	2,275,388	1,487,946
8,432,080	7,027,924	8,623,570	7,785,817
20,359,056	20,821,325	22,133,439	20,455,814
3,882,421	3,227,802	4,018,614	3,736,356
5,139,212	4,447,986	5,102,572	4,285,480
39,259,886	34,439,031	39,729,814	35,999,827
	13,943,903		13,856,471
	996,337		1,462,894
	3,757,015		3,894,073
	12,173,546		12,662,641
	1,788,320		2,011,529
	1,779,910		2,112,219
16,063,469	15,636,378	14,512,118	14,618,894
6,674,221	5,829,776	6,408,779	6,161,725
1,588,643	1,876,709	1,659,747	2,209,820
7,365,756	7,047,866	9,731,246	9,160,309

total production are given. [a] Prior to January 1951, statistics were given on the basis of total weight. [f] Includes data for spreader and calendering type resins. [g] Includes data for acrylic, polyethylene, nylon, and others. [h] Includes data for epichlorohydrin, acrylic, polyester, silicone, and other protective coating resins. [i] Includes data for acrylic, rosin modifications, nylon, silicone, and other plastics and resins for miscellaneous uses.

Acetate display looks like mirror (top); flashing light reveals rose (bottom)

Acetate Display

SILVERED cellulose acetate sheet is used to make a "one way mirror" used in an effective point-of-purchase display made for Melrose Distillers, Inc., Cedarhurst, Md.

The display consists of a bottle of liquor on a stand next to a box fabricated of the silvered acetate material. The acetate used is clear 0.010-in. thick material which has been silvered by vacuum deposition. The translucent material is made by Coating Products, New York, N.Y., and the box is fabricated by Wesco Associates, Inc., New York, N.Y.

The silvered acetate box normally looks like a mirror. But when a light flashes on inside the box, it becomes transparent and reveals a life-size rose which carries out the motif of the Melrose label.

Photos courtesy Bakelite Co.

Extruded vinyl tubing replaces textile cord as lining for sport jacket welting

Jacket Welting

MOISTURE-resistant vinyl tubing is being used by Revere Knitting Mills, Inc., Malden, Mass., for the raised welting around the pockets of its sports jackets. The tubing replaces textile cord which retained moisture longer than the jacket material of which it was a part. Extruded of Vinylite by Maynard Plastics, Chelsea, Mass., the tubing will not flatten out when pressed, remains flexible at normal temperatures, and resists most chemicals.

Flexible raised vinyl welting resists moisture, does not flatten when pressed

Photos courtesy Libbey-Owens-Ford Glass Co.

Continuous sheets of polyvinyl butyral interlayer for safety glass are cut to pattern after moisture is removed. Plastic is then separated into sizes, washed, and light tested

Tinted Safety Glass

GLARE and heat are substantially reduced by a new tinted safety glass, developed for Buick windshields by Libbey-Owens-Ford Glass Co., Toledo, Ohio. The glass, called E-Z Eye Safety Plate, consists of two layers of specially treated glass bonded to a tinted polyvinyl butyral interlayer. It goes through the same casting and finishing processes as safety glass.

The butyral is processed by integrating a modulated shading to the upper part to reduce infra-red and ultra-violet rays.

Continuous sheets of the plastic are first carefully dried to remove moisture. They are then cut to pattern, separated into sizes when cut-off edges are removed, and washed and examined under polarized light. The interlayers are spread between twin layers of curved plate glass on a conveyor belt, after which the sandwich is laminated by heat and pressure in an autoclave.

Treated butyral interlayer is spread between twin sheets of glass on conveyor; shaded part is fitted to upper windshield edge. Sandwich is laminated by heat and pressure

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for plastic boxes

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for
push-fit assembly
drive screw assembly
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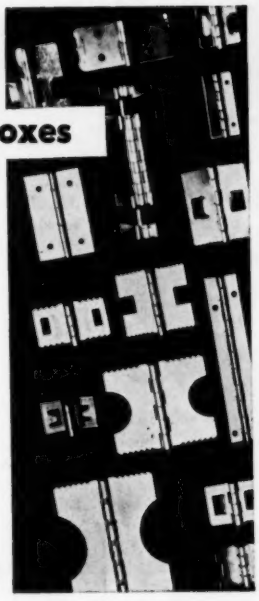

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FABRICATED IN THE 1st PLACE---
NEVER TO TAKE 2nd PLACE!!

Canister Set molded by Burroughs of California from TRU-CASTINGS.

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by rapidly wet painting three-dimensional parts, one color after another, through the use of our accurate, snug-fitting

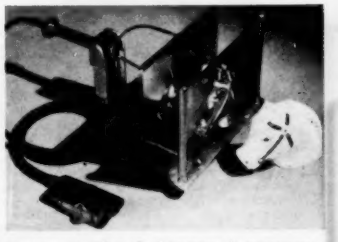
ELECTRO-FORMED METAL MASKS

(MADE BY PATENTED PROCESS)

and foot treadle

AIR-OPERATED FIXTURES

which position and hold the piece snugly in the mask, maintain the desired pressure, and permit the operator to use both hands.



Plug-type masks for keeping depressed areas clear, while spraying background; lip-type masks for protecting the background while painting depressed areas; and block cut-out plane surface type masks.

Clean, sharply defined letters and decorative effects are obtained on intricate die castings, stampings and plastic forms by accurate control of painted areas with no fogged edges. After-wiping or buffing off of overspray is unnecessary. The "loose" inside of letters and numerals, such as "O" and "6", is held in position by arched bridging to eliminate objectionable "ties."

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positioning parts in masks while painting or holding parts in place for other operations, such as welding.

Automatic, entirely air-operated machines for spray decorating a variety of small plastic and metal parts—one color right after another—at speeds of up to 3600 per hour.

Eliminates the hazards of electric motors, mercury or solenoid switches and the cost of explosion-proof electrical equipment.

Masks are inserted so as to be flush with top of the working table. Spraying is from below. Frequency of mask cleaning greatly reduced. Dial regulates the cycling speed. Using a conveyor belt, operator can use both hands to load.

Another dial regulates the amount of paint sprayed. At any given setting, the same amount of paint is sprayed on every part, regardless of the speed of the loading cycle. Effects paint savings of up to 50 per cent over hand spraying.

Employs 8 latest automatic guns and two 2-gallon air-agitated paint pressure tanks with four insert containers.

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Heat Tubing

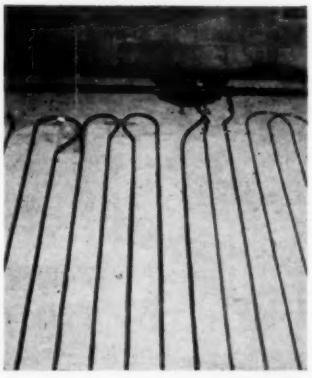
TIGHTENING allocations on metals has led Bjorksten Research Laboratories, Inc., Madison, Wis., to experiment with three types of plastic tubing for radiant floor heating. Materials used are ⅛-in. polyethylene, 3/16-in. vinyl chloride copolymer, and 1/16-in. vinylidene chloride, all having a ½-in. internal diameter. Advantages claimed for what is believed to be the first instance of plastics tubing for heating purposes are freedom from corrosion and lower initial and installation costs than those required for metals.

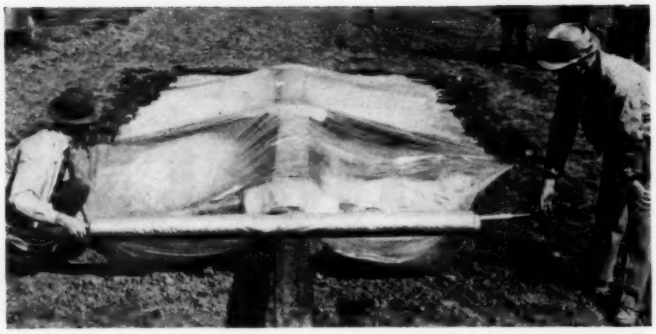
In laying the tubes, 1 in. of formed concrete with recesses 6 in. apart is first poured and allowed to set. After the concrete has set, plastic tubes are laid in the recesses in long parallel lengths with bends for returns. Since all tubing is of one length, bent to desired shape, no couplings are required. Plastic tubing is connected to iron pipe risers or headers by sealing with hose clamps.

After tubes are laid, they are covered with a thin layer of concrete which is permitted to set before the addition of a final layer of concrete. In all, 2 in. of concrete cover the plastic tubes.

The plastic tubing was under observation for three winter months, during which time water—never raised above 135° F.—was circulated through the system. Satisfactory results were reported at the end of the test period.

Connections from plastics heating tubes are sealed to risers with hose clamps





Photos courtesy Firestone Plastics Co.

Vinyl cover for soil fumigation method, easily handled by two men because of its light weight, is unrolled over area to be treated. Packed soil will make air- and gas-tight seal

Soil Fumigation Cover

CHEMICAL fumigation of soil has been facilitated by the introduction of a vinyl seed-bed cover. The gas-tight cover, called Fumi-Cover, is made by Besmar Products Corp., Binghamton, N.Y. of Firestone's Velon. It permits the effective use of a system for the complete elimination of weeds and soil pests.

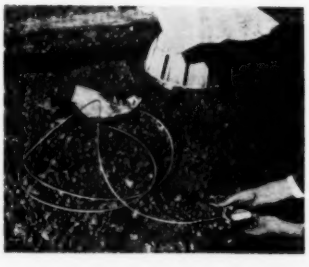
Fumi-Cover was developed by Firestone in cooperation with the U.S. Dept. of Agriculture Extension Service. The Velon plastic used is 4-gage film. In addition to being gas-tight, it is moistureproof, highly resistant to damage from weather conditions, and extremely durable, making it possible for the cover to be used season after season. Another characteristic contributing to efficient use of the treatment is its light weight, permitting convenient handling.

Fumigation of the soil with methyl bromide and the Velon Fumi-Cover is a comparatively simple operation. The first step is to place supports, such as crates or boxes, in a row down the center of the bed to be treated, with boards between them to complete the framework. Tubular saran applicators, leading from vinyl bags containing the fumigant, are then spaced at about 25-ft. intervals, and the Fumi-Cover is rolled over the entire area. Edges are sealed with packed-down dirt as rolling progresses. The bag permits the gradual release of gas into the soil. The cover is left on for a period of 24 hr., and the soil is allowed to aerate for an additional 48-hr. period prior to planting.

Covers originally used for the methyl bromide soil fumigation method were made of building paper, but they tore or punctured easily, and were inclined to disintegrate or lose tensile strength upon exposure to moisture. Vinyl covers are not only sturdier, requiring less frequent replacement, but they are more than four times as light, and, thus, easier to handle. Moreover, the elasticity of Velon facilitates stretching the cover over the frame.

The Fumi-Cover, packed in a handy storage carton, is distributed nationally by The Dow Chemical Co., Innis, Speiden & Co., and Michigan Chemical Corp. Methyl bromide is available under such trade-names as Dowfume MC-2, Iscobrome, and Pestmaster Soil Fumigant-1 in cans opened by a special applicator that releases the gas through the tube.

Vinyl bag at end of saran tube permits gas to be released gradually into soil



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DRY BLENDER. Illustrated folder contains data on this company's laboratory and production size dry blenders for efficient mixing on an entirely new mixing principle. The Patterson-Kelley Co. (9-800)

CHEMICAL DEPARTMENT PRODUCTS. Booklet lists and briefly describes the range of molded plastics, silicone products, compounds and resins, laminated products, and other items manufactured by the Chemical Dept., General Electric Co. (9-801)

AUTO-CONTROL PRESSES. Folder explains the operation, pressure ranges, and advantages of Bipel compression presses. Includes breakdown drawing showing many features. B. I. P. Engineering Ltd. (9-802)

TETRAHYDROFURAN. Bulletin describes uses, applications, and properties of tetrahydrofuran which is a solvent for high molecular weight polyvinyl chloride and vinylidene chloride copolymers. E. I. du Pont de Nemours & Co., Inc. (9-803)

AUTOMATIC CYCLE CONTROLLER. Bulletin contains data on the Timemaster for automatically maintaining accurate cycles during compression molding. T. H. & J. Daniels, Ltd. (9-804)

WATER CONDITIONING. Folder describes silica removal from water by Amberlite de-ionization to provide water almost totally free from hardness, carbon dioxide, and silica. Rohm and Haas Co. (9-805)

VELON FILM. Folder illustrates in full color some typical applications which are being made with Firestone Velon plastic film in various gauges. Lists advantages of this material. Firestone Plastics Co. (9-806)

PRINTING ON PLASTICS. Technical manual contains data concerning printing methods for use on cellulose acetate and cellulose nitrate sheeting. Monsanto Chemical Co. (9-807)

MPC FACILITIES. Booklet explains the facilities available for custom compression molding and other supplementary activities at Molded Products Corp. (9-808)

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PLASTIC EXTRUDERS. Folder illustrates the features of a line of plastic extruders and extruding accessories. Contains specifications. Francis Shaw and Co. Ltd. (9-814)

ELECTRONIC SEAMER. Booklet describes the Singer electronic seamer for mass production of plastic items and the many attachments which are available for use with it. Singer Sewing Machine Co. (9-815)

INFRA-RED RADIANT HEATING. Folder shows the uses, construction, operating characteristics, and applications for Chromalox radiant heaters for glassless infra-red heating. Edwin L. Wiegand Co. (9-816)

SPEED NUTS. Brochure demonstrating how engineers set about developing Tinnerman speed nuts for a specific application. Tells how quality control is maintained during manufacture. Tinnerman Products, Inc. (9-817)

CONSTRUCTION OF MOLDING PRESSES. Elaborate anniversary brochure of this company depicts in words and pictures steps involved in the building of hydraulic presses and pumps. Elmes Engineering Div., American Steel Foundries. (9-818)

AUTOMATIC PAINTING MACHINES. Complete operational details of new automatic spray mask painting machine for decorating plastics are contained in bulletin that includes dimensions, specifications, operating instructions, and description of auxiliary equipment. Thierica Studio. (9-819)

TEMPERATURE CONTROL UNIT. Data sheet describes new "straight line" temperature controller that automatically compensates for heat transfer lags. Includes specifications, diagrams, and applications. Wheelco Instruments Co. (9-820)

VINYL STABILIZERS. Service bulletin outlines properties and applications of two lead stearate lubricant stabilizers especially suitable for use with polyvinyl chloride. Witco Chemical Co. (9-821)

COLORING PIGMENTS FOR PLASTICS. Looseleaf bulletin evaluates Titanium pigments as colorants for rubber, plastics, and latex. Charts show brightness and opacity produced in sheet vinyl by various resin-pigment ratios. Titanium Pigment Corp. (9-822)

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HYDRAULIC TESTING MACHINES. This company's new line of hydraulic testing machines for tension, compression, transverse, and flexure testing is fully described in illustrated brochure. Tinius Olsen Testing Machine Co. **(9-823)**

VERSATILE NEW ACID. Booklet about commercially available Emery 955 Dimer acid. Gives properties, describes uses in polymerization and resinification in reaction with polyamines and polyalcohols. Emery Industries Inc. **(9-824)**

MULTI-PURPOSE EXTRUDER. The compounding, extruding, coloring, and scrap reclaiming functions of the Windsor twin screw extruder are explained in 4-page bulletin. Specifications are included. R. H. Windsor Ltd. **(9-825)**

NEW PLASTICIZER. Loose-leaf data sheets give properties and plasticizing performance of new "monomeric" plasticizer having low volatility, extra stability, and excellent compatibility. Carbide and Carbon Chemicals Corp., unit of Union Carbide and Carbon Corp. **(9-826)**

HYDRAULIC OIL PURIFIER. How to stop mechanical failures and costly repairs of hydraulic systems due to contaminated hydraulic oils is answered in eight-page brochure describing this firm's oil filtering devices. Honan-Crane Corp., subsidiary of Houdaille-Hershey Corp. **(9-827)**

DATA ON HOBBING STEEL. Four page bulletin contains charted results of flow characteristics of 10 types of hobbing steels. Detroit Mold Engineering Co. **(9-828)**

ACRYLIC FABRICATING SERVICE. Literature describes this firm's facilities for custom fabricating, tooling, deep drawing, machining, assembling, and free blowing of acrylic plastics. Amplex Mfg. Co. **(9-829)**

COATING AND SATURATING LATICES. Data sheets outline properties and uses of two groups of aqueous butadiene-acrylonitrile copolymer latices with special application in coating and saturating operations. The Goodyear Tire and Rubber Co., Inc. **(9-830)**

PLASTIC PIPE AND FITTINGS. Price list and specifications on Mills plastic pipe and fittings. Physical and chemical properties are tabulated and information is given on pipe welding and threading. Elmer E. Mills Corp. **(9-831)**

PROCESSING PLASTICS. Matched production units, consisting of Banbury mixer, mill, and calender, for producing plastic film and coatings are described in this illustrated bulletin. Complete specifications are given. Farrel-Birmingham Co., Inc. **(9-832)**

INDUSTRIAL OVENS. This 36-page booklet describes the performance which can be expected from seven different oven designs, including ovens suitable for curing and drying plastic products. Ferro Enamel Corp. **(9-833)**

SYNTHETIC POLYMER COATING EMULSION. Data sheet covering the characteristics of Polyco 350, a synthetic latex for use in paper coating, laminants and saturants, and as a reinforcing agent for other synthetic latices. American Polymer Corp. **(9-834)**

AIR MOTORS. Helpful 24-page booklet describing the construction of Bellows air motors and demonstrating many applications where they are used for cost reduction and speeding operations. The Bellows Co. **(9-835)**

CARBON BLACKS. Brochure giving typical properties of Cabot carbon blacks, uses in industry, etc. Chart describing Cabot pine products is also included. Four pages. Godfrey L. Cabot, Inc. **(9-836)**

LABORATORY PRESS. General applications, improved features, and accessories for general research are included in booklet on the Carver laboratory press. Prices and specifications included. Fred S. Carver, Inc. **(9-837)**

CUTTER AND TOOL GRINDER. Full descriptive catalog on the Cincinnati Monoset cutter and tool grinder for making new end mills, reamers, counterbores, etc., and for reconditioning old ones. The Cincinnati Milling Machine Co. **(9-838)**

ENGINEERING PROPERTIES OF INCONEL. Engineering data on Inconel—high-strength, heat- and corrosion-resisting alloy. Information on corrosion resistance working properties, and typical applications in industry. International Nickel Co., Inc. **(9-839)**

EXTRUSION EQUIPMENT. Various extrusion machines are described in this 16-page booklet, and complete specifications are given. Two nomographs aid in the solution of plastics production problems which can arise when using these extruders. National Rubber Machinery Co. **(9-840)**

GIANT MOLDING FACILITIES. Equipment and services of company's 100-press injection molding plant shown in illustrated 24-page booklet that also describes facilities for assembling, fabricating, heat sealing, extruding, mold making, and hobbing. Ideal Plastics Corp., Div. of Ideal Toy Corp. **(9-841)**

TENITE I AND II. Complete specifications, tabulations and charts of physical properties, and testing methods are presented in this 24-page brochure on Tenite I and Tenite II, cellulose ester thermoplastics produced by Tennessee Eastman Corp. **(9-842)**

ACETATE CEMENT. Technical data sheet discussing a water-white solvent combination formulated specifically to replace acetone in the bonding of cellulose acetate to cellulose acetate. Schwartz Chemical Co., Inc. **(9-843)**

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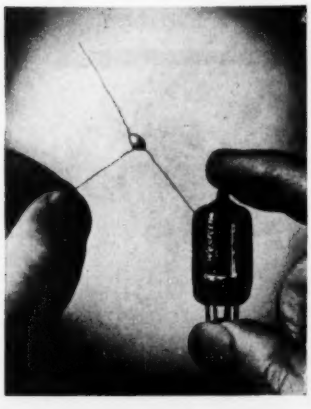
Transistor

REVOLUTIONARY effects on the electronics industry are predicted for the transistor, an amplifying device said to be the first serious rival of the vacuum tube—yet a structure so small it can fit into a plastic bead half the size of an average garden pea.

The latest type of transistor, known as a junction transistor and developed by Bell Telephone Laboratories, is a tiny rod of germanium treated so that it embodies a thin, electrically positive layer sandwiched between two electrically negative ends. The entire rod is encased in a hard bead about 3/16 in. in diameter cast of a styrene polyester thermoset material. This plastic material, which acts as an insulator as well as the enclosure, was chosen because of its ruggedness, its insulating properties, and its ability to be worked easily. Three electrical connections fastened to the germanium extend through the plastic housing.

Exceedingly low power consumption is said to be a major feature of the transistor which requires only about a millionth of the wattage needed by vacuum tubes for similar operations—yet can amplify electrical signals 100,000 times. Other merits include high power-handling capacity and efficiency, low noise figure, good shock resistance, and compactness. It also offers freedom of circuit design and a variety of input-output impedances.

Compact transistor is encased in and insulated by cast styrene polyester



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THE CELLOBOARD MACHINE® is causing a revolution! From a combination of thermosetting resin and inexpensive chips, sawdust, scrap, shavings and other waste, it produces as much as twenty feet or more of four foot wide board every minute.

The process is continuous. There's no downtime for the [illegible] to be unloaded and recharged. The machine is [illegible] productively 100% of the time.

WHAT THE MACHINE IS ARE

The beautiful part of Celloboard is that it converts a total waste product into a valuable commercial [illegible]. Celloboard has wide applications in building and home construction, furniture manufacture and other places where plywood and cut lumber are now used extensively. There are limitless markets for this strong, lightweight, fire-resistant product.

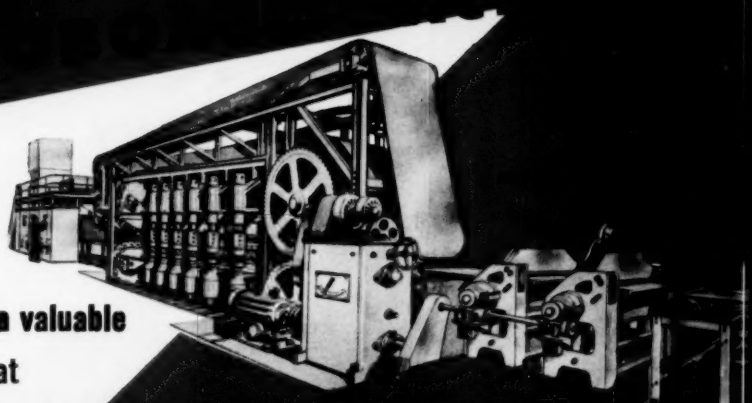
FAST AMORTIZATION

The Celloboard Machine has a low break-even point. It covers all costs and begins earning a profit when operating at only one-quarter of capacity. Normal wood waste supplies and uormal demand for Celloboard should keep the machine going full time . . . except for routine maintenance. The Celloboard which is produced can be sold at attractive commercial prices.

One of the distinct advantages of Celloboard is the fact it can be surfaced with plain or fancy paper *during manufacture*. After manufacture, plain Celloboard, which itself has an attractive adaptable surface, can be laminated with other materials to increase its utility. Shown are: (1) cork faced, (2) faced with plain paper, (3) faced with fancy printed paper, (4) plain Celloboard, and (5) laminated with a veneer of Canadian walnut.

Facts about CELLOBOARD

length	unlimited
width	4 feet
thickness	3/16" to 3/4"
density	0.50 to 0.75



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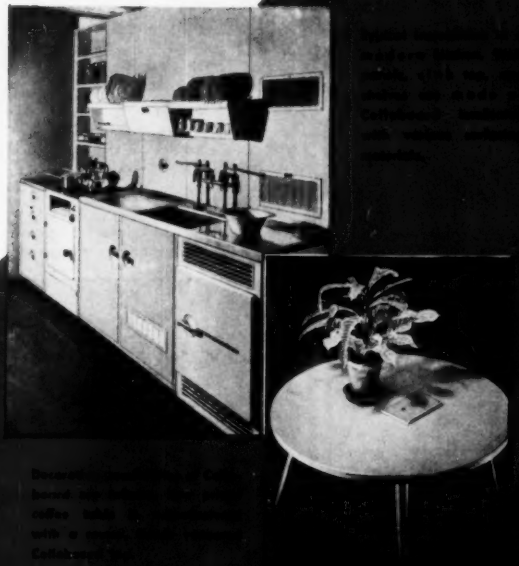

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Cast Plastic Lens

ONE of the largest plastic lenses ever made is being cast by Polaroid Corp., Cambridge, Mass., for use in RCA theater television projection systems. The 22½-in. lens, which costs only a small fraction of the cost of a similar glass lens, is the latest in a series of plastic optical elements produced by a technique developed by Polaroid during the war under the sponsorship of the National Defense Research Council[1].

This lens, the largest one for a Schmidt optical system ever manufactured commercially, is designed to make a giant television picture, 15 by 20 ft., look as sharp as it would appear on a living room set. The lens helps project a television image from a spherical mirror onto the large screen without distortion or imperfect focus around the edges.

Polaroid plastic optical elements combine the economies of mass production with the optical accuracy usually found only in lenses of ground and polished glass. They also open entirely new opportunities in optical instrument design because of their light weight, the ease with which difficult shapes can be produced, and their ready machinability. These cast plastic elements offer large cost savings over glass when the piece is large, requires unusual shaping, or when it calls for an aspheric surface.

[1] "Cast Plastics for Precision Optics," MODERN PLASTICS *23*, 116 (Jan. 1946).

Giant lens projects sharp T.V. images, is cast to shape in Pyrex glass molds
Photos courtesy Polaroid Corp.

For special lens, plastic is gravity-fed through cornucopia into the mold

The optical elements are cast of special formulations which make use of two common materials, methyl methacrylate and styrene, and a material made by Polaroid, cyclohexyl methacrylate. This material is cast to required shape in Pyrex glass molds.

The material is partially polymerized before casting and is poured into the molds in a viscous state. Polymerization is completed in the molds by a program of heat treatment which may last for several hours or several days, depending upon the size and shape of the piece.

On special jobs requiring only one or two elements, Polaroid uses a simple method of pouring the partially polymerized material into the mold. The thickened plastic is first poured into a clean dust-free cornucopia made of sheet plastic. The cornucopia is sealed at the top, immediately, and the material is then allowed to flow out by gravity through the snipped-off lower end into the mold.

The optical surfaces of Polaroid plastic lenses are complete when they come from the mold and need no grinding or polishing. The material can, however, be machined easily with conventional metal working equipment. This permits the use of simple methods of mounting, thus reducing overall cost of the instrument in which the lens is used.

Orientation

(*Continued from pp.* 113-126)

9000 and 10,000 percent exhibit much less retardation than other specimens elongated much less. These specimens are also weaker than other specimens elongated less but which exhibit greater retardation. Some anomalies are also to be noted. Three specimens elongated 1200 percent are reasonably equal in strength but show widely divergent retardations. The best that can be said, therefore, is that a general agreement between retardation and tensile strength is to be found.

Low-Angle X-Ray Diffraction—Birefringence measurements show that a considerable amount of orientation of some kind exists in the stretched polystyrene, presumably caused by alignment of the molecules in the direction of stretching. The question has also been raised: is there an accompanying regular array of molecules or molecular segments which approaches a "crystalline" condition such as is found in some other high polymers like stretched rubber and nylon?

Low-angle X-ray diffraction studies were, therefore, made of annealed polystyrene and of material stretched as much as 7200 percent. Figure 15 gives some of the results. There is no indication of a crystalline structure. The changes in mechanical properties, therefore cannot be attributed to any marked structural change resulting in a regular internal array.

Conclusions

1) Tensile strength and modulus of elasticity in the direction of elongation are both increased by elongation to approximately 1200 to 2000 percent, depending upon load rate strain rate, and temperature. At higher elongations tensile strength decreases somewhat. Maximum tensile stresses may be doubled or tripled; modulus of elasticity may increase by approximately 25 percent.

2) In flexure, maximum bending stress and bending modulus of elasticity are increased by elongation to approximately 700 percent. Bending strength is approximately doubled, while bending modulus is increased approximately 20 percent.

3) At all temperatures the tensile and bending strengths of the elon-

gated material are greater in the direction of elongation than those of the annealed, unoriented material.

4) Torsional strength is decreased, while the shearing modulus is increased moderately by elongation.

5) Three-dimensional plots of stress, strain, and time, derived from creep and relaxation tests, show an increasing divergence with stress, strain, and time, and the divergence seems greater at higher elongations.

6) Maximum strain to fracture is increased by elongation. In bending, the material may merely bend through without fracturing, and in torsion a fibrous separation without actual complete fracture may occur when the material has been elongated about 500 percent or more.

7) Elongation lessens crazing, which, in tension, disappears at about 1100% *at room temperature*.

8) The fracture changes from a sharp break, likely to be accompanied by shattering, at zero elongation, through a progessively more fibrous type of fracture until at elongations above approximately 1100 percent the fracture becomes completely fibrous. Fibrous fracture begins at the periphery of the specimens and occupies more of the interior as percent elongation increases.

9) Birefringence measurements show a marked orientation effect in the elongated material, but low-angle X-ray studies reveal no "crystalline" patterns.

The authors wish to acknowledge particularly the support of the Plastic Materials Manufacturers Association which sponsored the project under which this investigation was conducted. Mr. Frazier Groff of Bakelite Co., Div. of Union Carbide and Carbon Corp. supplied the polystyrene. Helpful suggestions and criticisms were received from the Polystyrene Subcommittee of the P.M.M.A. Technical Committee: E. Y. Wolford, H. W. Mohrman, R. Buchdahl, and J. Adams.—END

Correction

On page 110 of the story "Effect of Absorbed Water on Physical Properties of Molded Phenolics" appearing in the July 1951 issue of MODERN PLASTICS, the thickness of the disk, Fig. 3, should read ⅛-in. instead of ½-inch.

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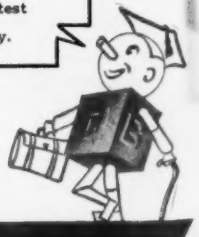

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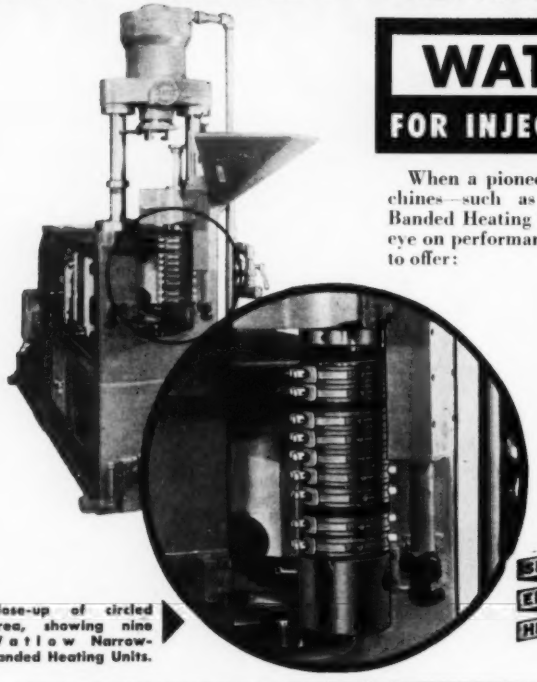

Close-up of circled area, showing nine Watlow Narrow-Banded Heating Units.

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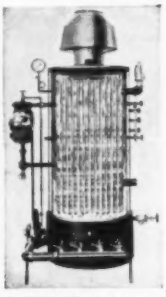

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NEWS AND INTERPRETATIONS OF THE NEWS

By R. L. Van Boskirk

Progress in Fluorinates

THE various fluorinates, Teflon and Kel-F, have now been on the market for several years. Progress in volume use has been slow because these materials are costly, in only limited production, and a little more difficult to process than the more common plastics. But their high heat and chemical resistance plus long life make them highly valuable for special applications. The greatest difference in their chemical structure is that Kel-F contains a chlorine atom while Teflon does not. The chlorine tends to change the properties somewhat in that it lowers heat resistance, but makes the material a little easier to process. Nevertheless, Kel-F still has a heat distortion point of around 392° F. It is asserted that Teflon will go up to at least 492° F. before distortion.

M. W. Kellogg Co., producer of Kel-F, reports that although the material is in tight supply, experimental quantities are available, and the material has now been applied over a wide field of applications where its particular properties have given general satisfaction. It can be described particularly as a high temperature resistant material with zero water absorption.

Because it has very little cold flow, but has excellent memory and good frictional properties (slides easily), Kel-F is recommended for gaskets, valve disks, stem collar washers, etc., in contrast to other plastic materials that would flow under pressure when a valve is squeezed. It is recommended especially for joints that have to be broken frequently because the same gasket or washer can be reused.

Another type gasket is one made with a silicone rubber core over which Kel-F is compression molded. The combination gives resilience and chemical resistance. Silicone is the only core that can be used for this purpose because it will take the high temperature required in order to cover with Kel-F.

Still another type is made from either an extruded solid rod which can be butt joined and heat sealed into an O ring or a Kel-F jacket molded over a silicone ring to form a seal that functions like a gasket.

From liners to wire coating—Liners made from Kel-F film and used for chemical containers are highly satisfactory because of the material's chemical inertness. Even such highly corrosive chemicals as fuming nitric acid fail to attack it. Film is now being extruded in thicknesses of from 0.002 to 0.010 inches. It is produced in layflat tubular widths of from 3 to 20 in. doubled or 6 to 40 in. when unlayed.

A Kel-F wire coating for motors, now under development, permits operation at a temperature up to 175 to 200° C. and is resistant to moisture under any conditions. The coating, extruded on the wire or applied by dispersion, or tower coating, and baking, may be as thin as 0.002 in. in comparison to other high temperature materials that may require 0.020 inch. This type of wire is not recommended for ultra-high frequency work since its power loss is greater than Teflon or polyethylene. However, Kel-F coated wire can be used for general purpose box enclosed electrical wire in cases where high heat is generated and other insulation material may get soft or messy; a coating as thin as 1½ mils has been used for this purpose.

An outstanding use already well established is for diaphragms in valves for chemical plants where its inertness, flexibility, and high fatigue life offer advantages. Metal diaphragms for such purposes ordinarily are short lived.

The aircraft industry is interested in the material because it is not wet by water or ice and has high temperature resistance.

Medical and food servicing—Surgeons are using it for artificial eye implants, sutures, bone structure, and tubing as well as for hollow catheter and hypodermic tubing with inner diameters as small as 1/64 inch.

The food industry is concerned with its application on dough mixing rollers to which Kel-F is molded in ⅛-in. thicknesses. The material prevents sticking just as it does when applied to bread or meat loaf pans.

Hermetically sealed, molded transformer terminals have improved the efficiency of transformers which run at high temperatures. Until the advent of Kel-F it was difficult to produce transformer terminals that would conform to the rigid requirements demanded.

A material for laminates, made of glass cloth tower coated with Kel-F, which gives the strength and resistance of glass plus chemical resistance, is now being experimented with for slot wedges in motors and similar electrical purposes. The cloth is laminated on a press providing a temperature of 500° F., and 5, 10, or 20 layers may be used to obtain varying degrees of rigidity. The same type laminate can be employed for non-sticking surfaces such as belts or tables where candy, medical pills, etc., are being assembled. This material can also be fabricated into liners for tanks and vessels where acids or alkalies are involved.

A possibility not yet exploited is extruded monofilaments or threads that could be woven into fabric for such uses as filter cloth.

Available in many variations—Kel-F can be obtained in three different grades of slightly different molecular weights. The three grades are also available in high or low density. The high density is in more general use, but some compression molders prefer low density for preforms or small parts. The high density grades are used for injection molding or extrusion because they feed better.

Another variation is the amount of plasticizer used in the formulation. The plasticizer is a low molecular weight Kel-F oil which may be used up to 25% of the total weight and gives flexibility to the compound. When a plasticized formulation is molded, it should be quickly cooled for maximum flexibility.

An extremely clear product can also be obtained from unplasticized

* Reg. U.S. Pat. Office

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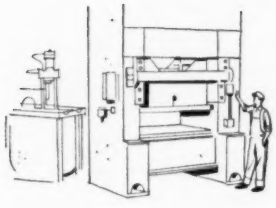

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Kel-F if it is molded in thin sections of ⅛ in. or less. Unless it is quickly cooled however, it will be hazy. Thicker segments cannot be cooled quickly enough to avoid the haze.

Dispersion form for coating purposes—The dispersion form of Kel-F is a formulation of very fine particles dispersed in a hydrocarbon vehicle. It can be sprayed, dipped, or slushed and applied to any type metal—except copper or copper-based alloys; Transite board; or fabrics that will withstand 500° F. Light sand blasting of the material is necessary before application of the dispersion. A pin-hole-free film offering reasonably good bond, chemical resistance, and a non-adhesive surface is obtained. When sprayed and baked in a mold, the dispersion also serves as a mold release for polyester laminates or rubber.

Acetate Replaces Metal

METALLIC acetate which looks like metal and has a mirror-like finish is being offered by Coating Products, Inc., New York, N.Y., as a replacement for metal in decorative applications. One radio set manufacturer has substituted gold metallic acetate for metal on the grille. A juke box manufacturer is now lining the interior of the cabinet with embossed silver metallic acetate. Another application is in the name plate and metal sign field where rigidity is obtained by laminating the metallic acetate to heavy board.

New Process for Making Plastics

THE possibility of making solid plastics from liquid raw materials by bombarding them with high voltage electron beams or cathode rays is foreseen as a result of experiments reported by General Electric Co.'s Research Laboratory. Generally, polymerization, in which chains of atoms are linked to form solid plastics, is accomplished by chemical means. Joining individual molecular units to form long chains, or polymers, results from a rearrangement in the electrons in the atoms of which the units are made. In the new experiments, the electrons are rearranged by firing other electrons with high speed at the liquid made of the separate units.

Most of the experiments were performed with tetraethyleneglycol dimethacrylate, but it was found that other compounds, including styrene, acrylonitrile, and methacrylates, can be polymerized with the speeding electrons.

Light Colored Phenolic

SURFACING of decorative laminates is the main application of Synco 418, a new light colored resin varnish produced by Snyder Chemical Corp., Bethel, Conn. The company reports that this modified phenol material has found general acceptance for the impregnation of printed base stocks in decorative laminates. In the darker wood grains and ordinary colors, the use of Synco 418 makes it unnecessary to use an overlay tissue. The resin has slight shrinkage during cure which is equivalent to the phenol varnishes used in core stocks and which results in laminates having greater flexibility, toughness, and flatness. Because of its clarity and freedom from crazing, Synco 418 has also demonstrated advantages in the surfacing of hardboards, asbestos boards, and plywood.

Since the new resin does not have the light stability of melamine, it had not been possible until recently to use it unrestrictedly for standard grades of decorative laminates. Within the past few months, however, a new technique has been developed which makes it possible to prepare decorative laminates using Synco 418 in even the lighter colors and light wood grains by using a melamine tissue over the decorative stock. The panel construction comprises an ordinary melamine-impregnated overlay tissue which is placed over the Synco 418 impregnated decorative base and the usual number of core stock sheets. Standard cure times and pressures and other methods ordinarily used with all-melamine surfacing construction are employed. The producer says that Synco resins, which come in two grades—one with high viscosity and slow penetrating properties, and one with low viscosity and improved penetrating characteristics—are economical to use and make possible a 20% reduction in material cost.

Snyder has also announced increased facilities for production of its Synco 128 series resins which, the company asserts, will meet the performance of conventional resorcinol glues at lower cost. Because they have no water or other solvent, and contain virtually 100% reactive material, they have good gap filling qualities and do not craze or shrink. Since no water is introduced into the glue-line, sunken joints can be eliminated. The adhesives may be applied by mechanical roll spreader, glue-gun, and glue-brush. The producer asserts that one Synco 128 glue was adopted for laminating the plywood used in construction of the new Unicel freight cars.

Liquid Core Binder

AN IMPROVED liquid phenolic core binder resin formulated to meet critical foundry requirements has been developed by Chemical Div., General Electric Co. Designated G-E 12353, the resin is said to permit molding of stronger sand cores. Its use cuts baking cycle time in half, thereby increasing oven capacity.

Vinyl Plasticizer

LOW-cost plasticizer for vinyl compounds has been developed by Hooker Electrochemical Co., Niagara Falls, N.Y., for use in such formulations as sheeting, wire covering, and shoe soles which must withstand severe stretching and flexing. Called MPS-500, the plasticizer can be used alone or in conjunction with other plasticizers. It is said to impart flame retardance and high permanence on heat aging; excellent electrical properties; high strength; and good low temperature flexibility.

Polystyrene Finish

DEVELOPMENT of a new coating for polystyrene plastics, which is said to give a finish almost as brilliant as plating or metalizing, has been announced by Bee Chemical Co., 13799 South Avenue "O", Chicago 33, Ill. The coating, Logoquant R 2513, is used as a carrier for bronze or aluminum powders, and

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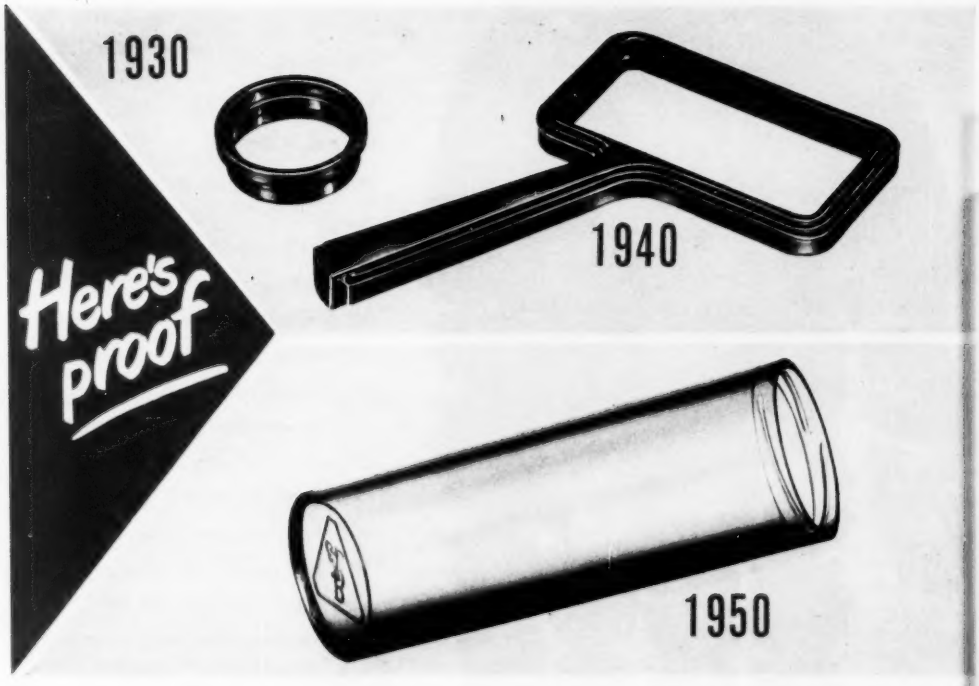

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is specifically designed for application on the reverse side of clear plastics. Preliminary tests have indicated that the coating does not craze or crack strained pieces, and retains its properties of adhesion, abrasion resistance, color fastness, and resistance to cold and heat.

Hook-Up

ANNOUNCEMENT by Zenith Plastics Co. on the West Coast and Brunswick-Balke Collender Co. in the Midwest that the two had joined endeavors for production of polyester plastics is an indication of the importance that many people attach to what may eventually become a big new branch of the plastics industry.

Brunswick-Balke Collender has been in the plastics molding business for many years, while Zenith has specialized in the development of reinforced plastics, particularly in the fabrication of parts for the aircraft industry. The company has recently developed a new material, Zenaloy, specifically for use in preform molding.

The two companies will consolidate their interest in reinforced plastic and thus the Muskegon, Mich., plant and the Marion, Va., plant of Brunswick-Balke Collender Co. will combine their efforts. Inquiries should be directed either to Zenith Plastics Co., Gardena, Calif., or to the executive offices of Brunswick-Balke Collender Co., 623 S. Wabash Ave., Chicago, Ill.

Cyanamide-Melamine Expansion

EXPANSION of facilities for the production of chemicals at Niagara Falls and Welland, Ontario, has been announced by North American Cyanamid, Ltd. At the same time it was announced that American Cyanamid Co. will install new equipment for the production of melamine at Willow Island, W. Va. Construction will be started immediately, and date of completion will be dependent on deliveries and supplies.

Calcium cyanamide and dicyandiamide will be produced at the Canadian plants. The former is used for such chemicals as acrylonitrile which is used in combination with polyvinyl chloride, and is an important factor in the production of nitrile rubber and synthetic wool-like fibers, while dicyandiamide is required for the production of melamine and will be shipped to company facilities at Willow Island.

American Cyanamid also announced completion of its consolidation of office and warehouse locations in Chicago and St. Louis. In each case, one newly constructed building is now replacing several scattered locations in each city.

Judges for S.P.E. Papers

CHIEF judge in the Third Annual S.P.E. Prize Paper Contest (see July 1951 Plastiscope) is Carl J. Frosch, Bell Telephone Laboratories. The judges serving with Mr. Frosch are Herbert S. Spencer, Durez Plastics & Chemicals, Inc.; Dr. Ralph K. Witt, Johns Hopkins University; George S. Nalle, Jr., Nalle Plastics, Inc.; and Sven K. Moxness, Minneapolis-Honeywell Regulator Co. This year's contest, like those of previous years, will be conducted first on a local and subsequently on a national basis.

Production Begins

PRODUCTION of laminated plastics has begun at the new St. Jean, Quebec, plant of The Panelyte Div., St. Regis Paper Co. (Canada) Ltd. A steady increase in output is expected until capacity operations are reached this fall. Facilities at the plant include five presses which are able to turn out a complete line of refrigeration molded parts, industrial sheets, tubes and rods, specially fabricated shapes, and decorative applications.

Paraformaldehyde Plant

UNDER the terms of a certificate of necessity granted by the government, Celanese Corp. of America has started construction of a large paraformaldehyde plant at Bishop, Texas, which is expected to increase U.S. output of the chemical by several times. Paraformaldehyde is a solid form of formaldehyde with little water, and is primarily used where aqueous formaldehyde is unsatisfactory. Defense end uses which required it include electrical parts for radio and radar equipment; resins for heavy duty brake linings for tanks; and other applications requiring an active, almost anhydrous chemical intermediate.

Benzoic Acid for Vinyl

REPORT is now current that an American chemical company will soon be in production on benzoic acid at a cost considerably below today's current price of around 43¢. Benzoic acid is claimed to be an ideal copolymer material for producing vinyl products (vinyl benzoids), that will compete with vinyl chloride and copolymer resins. Benzoic acid up until now, has been in a price range of fine chemicals, but a lower cost may make it possible to use this material profitably to produce vinyl copolymers. It is well known that the Germans proved the high quality of vinyl benzoids in relation to such properties as abrasion resistance, electrical properties, color, and low temperature resistance, but their production process was complicated and costly. The newly improved process is reported to be much more efficient and economical. Reportedly, this method has no connection with the small amount of benzoic acid now produced in styrene production which goes down the drainpipe because there isn't enough of it to be profitable, nor with the recently announced vinyl toluene process which might also produce benzoic acid as one of the many things made from toluene at the same time as methyl styrene.

Resorcinol Adhesive

ANNOUNCEMENT was recently made by the Chemical Div., Koppers Co., Inc., of a new room-temperature setting adhesive which uses 40% less scarce resorcinol, yet is still able to pass stringent tests that have heretofore been met only by straight resorcinol adhesives in the room-temperature setting field. Known as Koppers Penacolite G-1260, the modified resorcinol adhesive is available immediately to those users who are able to qualify under the present government regulations.

A company spokesman pointed out that demand for a superior

PLASTISCOPE

room-temperature setting adhesive now exists in numerous Armed Forces applications where facilities for curing the bond at high temperatures are impractical, such as in the construction of plywood P-T boats, Arctic huts, and prefabricated hangars for the Air Force.

Research at M.I.T.

PROMISE of a new fast method for control of cure of plastics in commercial molding operations and the discovery that molecular reorientation will greatly increase tensile strength of styrene were among the year's results reported recently to sponsors of a fundamental research program on plastics now being carried out at Massachusetts Institute of Technology.

Principal objective of the research program is to fill gaps in existing data and provide the material necessary for developing theories on the fundamental behavior of plastics under mechanical stress. The sponsors of this program are members of the Manufacturing Chemists' Association who are cooperating with M.I.T. Professor A. G. H. Dietz directs the work at the University.

Improved Plastic Pearl Sheets

PEARLESCENT sheet with improved physical and chemical properties is being manufactured by Acryvin Corp. of America at its New Jersey installation. The company claims that the new heat-resistant cast plastic is capable of being washed in boiling water and ironed without any deterioration. It is available in sheets and rods of all thickness and in blanks ready for machining into buttons by conventional methods.

Post Forming Device

POST forming of decorative laminates in fabricators' and furniture manufacturers' plants is possible with a device manufactured by Edward L. Wiegand Co., 7500 Thomas Blvd., Pittsburgh, Pa. and recently introduced by The Formica Co.

The principle on which the application is based is that of a "notched" sheet; in laminating the decorative sheet to the heavy plywood, a space of an inch is left in the plywood at the point where the material is to be bent. A greased piece of wood cut to size is placed in this empty space, and is removed when the flat lamination is completed.

In use, Chromalox strips using 4500 watts heat the material at point of notch from the top or decorative surface to a temperature at which the laminate can be bent. The heated layup is then locked into a jig which holds it in shape until it sets in its new form.

The Formica Co. is making two decorative laminate materials for post forming purposes. One of these materials will form to an outside curve of 1½-in. radius and an inside curve of ¾-in. radius, and costs 3¢ per square foot over standard Formica prices. The other material will form to radii of ⅝ in., both inside and outside, and costs 17¢ a square foot more than standard Formica.

Association Elections

AT THE May meeting of the Plastics Engineers Association the following officers were elected: Stanley Sapery, president; Bert M. Lahey, vice president; Joseph J. Eder, treasurer; and Fred R. Kay, secretary.

Resin Dispersion

AVAILABILITY of commercial quantities of a new nonsolvent-type, high-melting resin dispersion called Dresinol 155 has been announced by Hercules Powder Co. It is claimed that Dresinol 155 can be used as a modifier and extender for synthetic or natural rubber latices in adhesives, supported films, and binders of all types. It is completely compatible with all types of latices.

New Location for NPA

PART of the NPA staff has moved to the new General Accounting Office at 4th and "H" St., Washington, D.C. The Aromatics Section which handles benzene, styrene, phenol, naphthalene, plasticizers, etc.; the Public Relations Offices; and top administrative offices are now located there. The Plastics Section is still in Tempo Bldg. T on Constitution Ave. and 14th St. It will be moved to the new building soon. The new building is the second largest in Washington; only the Pentagon is larger. The new GAO building is six stories high, air conditioned, covers almost a complete block, and is equipped from top to sub-basement with new type extruded acrylic light diffusers.

Impregnated Packing

POLYTETRAFLUORETHYLENE braided packing called Palmetto 1330, which is made from chemically pure asbestos yarn thoroughly impregnated with Teflon resin, is now being produced by Green, Tweed & Co., North Wales, Pa. The packing is resistant to acids, alkalies, solvents, and corrosive chemicals from -150 to 550° F. It is easily cut or formed to most requirements and is recommended for jobs where conventional packings fail or are frequently replaced.

New Phthalic Anhydride Capacity

SECOND certificate of necessity for the construction of a phthalic anhydride plant has been requested by The Barrett Div., Allied Chemical & Dye Corp. The new plant, to be located at Philadelphia, Pa., is expected to produce 36 million lb. annually. It involves an expenditure of about $3½ million and will take 1½ years to build. The first certificate was requested for a plant now under construction in Chicago which will produce 30 million lb. of phthalic anhydride annually.

More Reinforced Plastic Panels

OPENING of a new branch plant in Portsmouth, Ohio, by Alsynite Co. of America is expected to double the company's manufacturing capacity of translucent reinforced plastic panels. The panels, which are molded from Laminac resin and reinforced with Fiberglas mat, are used by the armed forces for glazing and skylighting on Quonset huts and hangars. Civilian uses include partitioning, shower stalls, and awnings.

Resin Cement

PRODUCTION of Alfane, a light colored synthetic resin cement which is resistant to most acids, salts, solvents, and alkalies has

PLASTISCOPE

been announced by The Atlas Mineral Products Co., Mertztown, Pa. The company claims that, unlike other resin cements, Alfane sets hard in contact with concrete and metals, and exhibits outstanding adhesion properties for jointing brick and tile and adhering glass, concrete, metals, and other materials.

Accelerator for Resins

CASTING resins can be hardened in a few minutes at room temperature with Quick-Set, a liquid accelerator developed by Rezolin, Inc., 4825 W. Jefferson Blvd., Los Angeles, Calif. This accelerator is said to give higher physical properties to casting resins than have been previously attained with quick-set accelerators. Use of the material permits the production of master models, duplicating and foundry patterns, and jigs and fixtures in record time. Control of hardening time is possible by increasing or decreasing amount of Quick-Set used.

Phenolic Impact Molding Material

ANNOUNCEMENT has been made by Rogers Corp., Manchester, Conn., of RX-429, a phenolic impact molding material with impact strength of 0.8. The material, which can be automatically preformed on any standard tabletting machine, has a fast rate of cure and can be compression, transfer, or plunger molded. Typical properties include: apparent density, 0.38, minimum; compressive strength, 22,000 p.s.i.; and Izod impact strength (milled notch in side), 0.8 ft.-lb./in. of notch minimum.

Additional Molding Equipment

LATEST addition to the molding facilities of Sinko Mfg. & Tool Co., 3135 W. Grand Ave., Chicago, Ill., is a 32-oz. Watson-Stillman injection press. This unit supplements the company's larger Watson Stillman press, installed approximately a year ago, and eight additional presses ranging in capacity from 4 to 12 ounces. The company, which manufactures its own line of auto accessory items and does custom molding, has its own paint finishing facilities and also handles metal stamping, metal-plastic assemblies.

Plastics Men for Ordnance

TRANSFER of Thomas Blevin, who has been a plastics technician in the Forest Glen section of the Army Medical Center, to the Non-Metallic Materials Section of the Ordnance Corps, where he will concentrate on plastics developments, has been announced.

Callom B. Jones, a recent graduate of Randolph Macon University, has joined the section and will work on adhesives research as well as assist in plastics. This section is under the direction of Gerald Reinsmith.

Packaging Schools

ESTABLISHMENT of packaging schools approved by the Munitions Board has been announced. Each school will train about 2000 military and civilian personnel yearly. Two-week courses in preservation, packaging, packing, marking, and carloading will cost students only transportation and lodging expenses. Firms with government prime or sub-contracts may request application forms from Munitions Board Packaging Agency, Washington 25, D.C.

Misinterpretation

AN ITEM appearing in the Plastiscope on page 180 of the March 1951 issue, concerning Joao Muller, representative of Omni Products Corp. in Brazil, has been inadvertently misconstrued in that country.

Mr. Muller was stated to be "industry advisor to the Carteira De Exportacao e Importacao." We are now advised that while Mr. Muller has been empowered by a section of the Plastics Industry in Brazil to act on its behalf, he has no official capacity in the Carteria.

Acetate Adhesive Disk

INTRODUCED recently after two years of research by Thompson Winchester Co., Inc., 201 State St., Boston, Mass., is an acetate disk, adhesive on both sides, that adheres to a variety of surfaces including glass, metal, wood, and tile. Called Stik-tack, the semi-opaque disk is about the size of a dime and can be used over and over without damaging the surface from which it has been removed. The adhesive material is a by-product of petroleum which will not dry out, is not oily, and does not stick to the fingers.

Furfural

NEW prices on furfural products have been announced by The Quaker Oats Co. In tank car lots, furfural will now sell for 10½¢ a lb., furfuryl alcohol for 19¢ a lb., and tetrahydrofurfuryl alcohol for 40¢ a pound. The advance on furfural, the basic chemical from which the others are derived, is the first since 1943.

FINANCIAL

The Dow Chemical Co. has reported record breaking sales of $339,588,268 for the year ending May 31, 1951. The sales figure was 54% above that of the previous year. Net earnings were an all-time high of $41,334,744. The company put $91 million into plant and property additions during the year, and has averaged $59 million in expansion during the past five years. Arrangements have been made to borrow up to $140 million to facilitate further expansion. Earnings per share of common stock were $6.12, a 7% increase over 1950. Plastics was the growth leader in the sales picture, accounting for 28% of the sales dollar as against 23% in the previous year. Heavy chemicals were 53%; agricultural chemicals 7%; fine chemicals 4%; and magnesium 8%.

The annual stockholders report further stated that Dow, the nation's largest consumer of benzene and chlorine, will substantially increase its chlorine production very soon, and will obtain more benzene from the petroleum industry. The introduction of new polystyrene formulations broadened their markets considerably in the plastics field. The use of saran film in food packaging and latices in protective coatings has increased as has the use of saran for seat covers and window screens. The new saran yarns facilities in the plant owned jointly with The National Plastic Products Co., Odenton, Md., has just been started; the most promising market for the product, at present, is carpeting where a half-

PLASTISCOPE

and-half mixture of saran and wool has superior qualities.

The report mentioned production of Styron would begin soon at the new plant at New London, Conn.

COMPANY NOTES

Reichhold Chemicals, Inc., has announced the launching of a $10 million expansion program which will include doubling the company's output of phenol and phthalic anhydride. The first step in the new expansion program is the opening of executive offices in the International Bldg., Rockefeller Center, 630 Fifth Avenue, New York, N. Y.

Jessall Plastics, Inc., has moved to Farmington Ave., Kensington, Conn.

The Watson-Stillman Co., Roselle, N. J., has announced the appointment of **Don W. Patterson Co.,** 2016 Rand Bldg., Buffalo, N. Y., as its western New York state sales agent.

Ferro Corp. has elected three new vice presidents: **Glenn A. Hutt, G. W. Wallace,** and **E. W. Dany.**

The Lewis Welding & Engineering Corp., Bedford, Ohio, has purchased rights to the exclusive manufacture and sale of the MacRay 4-oz. plastic injection molding machine from **MacRay Engineering Co.,** Cleveland.

Monsanto Chemical Co. has announced that **Howard K. Nason** has been appointed director of research of the **Organic Chemicals Div.,** and that **Robert H. Kittner** has joined the **General Development Department. Robert W. Crawford** has been named to head the newly-established **Business Research Dept.,** in the **Plastics Division.**

Irvington Varnish & Insulator Co. has announced the following personnel promotions: **E. A. Freiburger** has been named general sales manager of the **Coating Div.; Jean H. Rooney** succeeds him as sales service manager; **James D. Smith** has been named varnish sales manager.

World Plastex, Inc., 1685 Boone Ave., Bronx, N. Y., has been formed by the merger of World Plastex and Apex Plastics, Inc. The new company will offer custom extruding facilities for many materials, including polystyrene, acrylic, and rigid polyvinyl. **Charles F. Hutchen,** formerly president of Apex, has become a member of the new company.

The Dynakon Corp., 5509 Hough Ave., Cleveland, Ohio, laminator and molder of reinforced plastics, has announced the appointment of the following officers: **Harry Raech, Jr.,** president; **Frank Griffen,** vice president.

The Busada Mfg. Corp. has recently been established at 58-99 54th St., Maspeth, L. I., N. Y. and will produce rigid plastics tubing and pipe up to 4½ in. outside diameter. The manager of the new plant is John Boosahda, formerly of Omni Products Corp.

Miller Motor Co., Chicago, Ill., manufacturer of air and hydraulic cylinders, has started production at its new, 50,000 sq. ft. plant at Melrose Park, Ill.

Ohio-Apex, Inc., Nitro, W. Va., has announced the following personnel appointments: **Andrew A. Payne,** chairman of the board of directors; **Bernard H. Jacobson,** president; **Paul E. Willard,** assistant director of research.

Crescent Plastics, Inc., has moved its plant and offices to 955 Diamond Ave., Evansville, Ind.

Wabash Metal Products Co., 1569 Morris St., Wabash, Ind., has acquired the exclusive manufacturing, advertising, distribution, and sales rights for Wabash Hydraulic Presses, formerly manufactured by Laboratory Specialties, Inc., also of Wabash. The hydraulic presses of 3-, 12-, 20-, 30-, and 50-ton capacity are used by the rubber, plastics, and wood industries.

Harte & Co., Inc., has opened offices and a showroom at 937 Maple Ave., Los Angeles, Calif., for displaying Wataseal plastic fabrics.

The Bellows Co., Akron, Ohio, manufacturer of pneumatic equipment, has announced the following personnel appointments: **Herbert B. Link,** president; **L. F. R. Bellows, Jr.,** vice president; **Byron D. Kuth,** secretary-treasurer, and **W. C. Richards, Jr.,** executive assistant to the president.

Plastic Jewel Co., Inc., W. Orange, N. J., has appointed **The Robert J. Marcy Associates,** 1776 Broadway, New York, N. Y., as exclusive representative for the former's line of custom injection moldings.

Scott Testers, Inc., announces election of the following officers: **David C. Scott, Jr.,** president; **James M. Scott,** production manager; **Harold W. Horton,** general sales engineer; and **Harald R. Rusmussen,** in charges of sales, research, and development of Mooney Viscometer Division.

The Black Bros. Co., Inc., plywood machinery manufacturer of Mendota, Ill., announces the election of **Robert S. Black** as president, and **James S. Carroll** as vice president.

W. Howard Stagg, Plastics Engineering, has moved to larger quarters at 1398 W. Tioga St., Philadelphia 40, Pa.

The Goodyear Tire & Rubber Co. has appointed **E. H. Dours** as sales manager of the **Pliofilm Department. M. J. Rhoad** has been named to the sales staff of the **Chemical Div.** and **George T. Duffin** has joined the **Films and Flooring Div.** as a field representative with headquarters in San Francisco.

PERSONAL

Glen M. Alford, formerly sales manager of the **Industrial Products Div., Modglin Co., Inc.,** Los Angeles, Calif., has been named general sales manager for the **Plastics Division.** He joined the firm in 1946.

John J. Hager, formerly of B. F. Goodrich Chemical Co., has joined **Pioneer Latex & Chemical Co.,** Middlesex, N. J. He will be in charge of the development and sale of adhesives and products sold to the automotive trade.

John A. Silver, formerly with Lester and Silver, has been appointed director of sales for **American Wheelabrator & Equipment Corp.,** Mishawaka, Ind., as part of the reorganization and expansion of the company's sales staff.

John Fletcher, specialist in the

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★ COLORING
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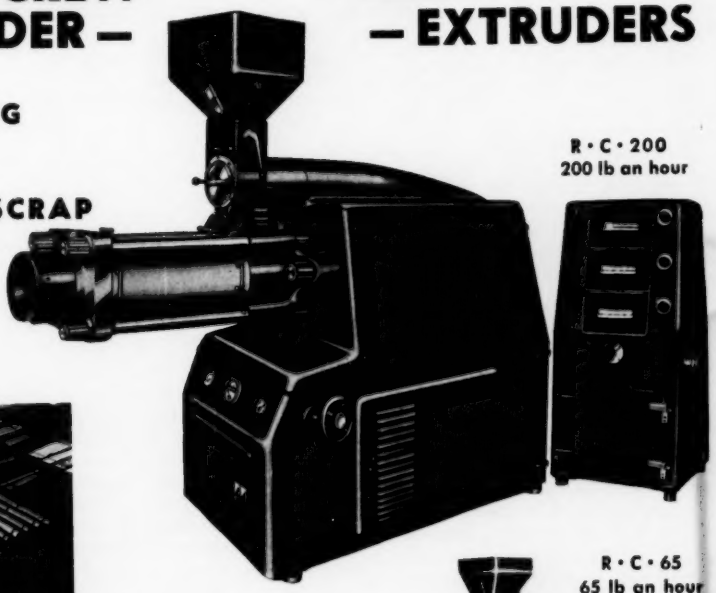

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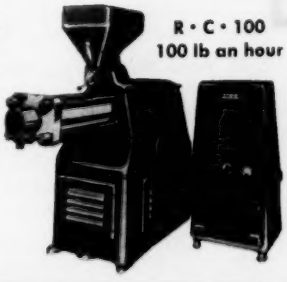

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field of varnishes, synthetic resins, and protective coatings, has joined **Arthur D. Little, Inc.**, Cambridge, Mass.

Patrick H. Vertino has joined the technical sales staff of **John H. Calo Co., Inc.** He has been associated with the paint and resin industries for a number of years.

Dr. Edward G. Locke has been named chief of the division of derived products of the **U. S. Forest Products Laboratory** at Madison, Wis., which conducts research in wood chemistry.

Jim Bright has been named general sales manager for the Burrite line of plastic housewares manufactured by **Burroughs Mfg. Corp.**, Los Angeles.

Charles P. Steuber has resigned from Carbide and Carbon Chemicals Co. to establish his own foreign sales organization at 11 W. 42nd St., New York, N. Y. The company will specialize in handling foreign sales for American producers of chemicals and related products and will act as the American purchasing and sales representative for various foreign companies.

Sherry O'Brien has been promoted to vice president in charge of sales for **Thermel, Inc.**, 3440 W. Lake St., Chicago 24, Ill., manufacturer of Thermaheaters, Thermabands, and Thermaplatens for electric spot-heat applications.

Dr. Harry Wechsler, specialist on polymerization phenomena, has joined **DeBell & Richardson, Inc.**

W. Ward Willett has been appointed merchandising manager of **Plax Corp.**

Harry N. Stevens has been named director of colloid and textile research for **The B. F. Goodrich Co.** He has been with the firm since 1935.

Dr. John D. Zech has joined the central research laboratory of **Atlas Powder Co.** as group leader of the organic section.

V. G. Bartram, president of **Shawinigan Chemicals Ltd.**, has been elected president of **B. A.-Shawinigan Ltd.**, 600 Dorchester St., W., Montreal, Canada, a newly-organized petrochemical company owned jointly by **British American Oil Co. Ltd.** and **Shawinigan Chemicals Ltd.**

Max A. Minnig, vice president in charge of **Witco Chemical Co.'s Carbon Black Div.**, was elected to the board of directors.

Prof. J. W. Perry of Massachusetts Institute of Technology has been appointed director of the **Chemical Literature Div.** at **Bjorksten Research Laboratories.**

Eugene S. Massey has been assigned as technical sales representative in Cleveland for **Hercules Powder Co.'s Synthetics Department. John M. Martin**, formerly assistant general manager of the company's **Cellulose Products Dept. has been** transferred to the **Explosives Dept.** where he will assume the duties of assistant general manager.

Gordon Groth, formerly president of Electra Mfg. Co., has been appointed executive vice president of **Erie Resistor Corp.**

James N. Mason has been appointed executive vice president of the new **Coated Products Div., Interchemical Corp. Edgar S. Thompson** has been named director of development and will coordinate the chemical, engineering, and research efforts in the development of all new products.

Arthur L. GeWertz, 521 Fifth Ave., New York, N.Y., has been named eastern representative for **Krieger Color & Chemical Co., Inc.'s** line of Poly-Supra plastic colorants.

Thomas J. Martin, manager of **Monsanto Chemical Co.'s** Detroit office, has been given a leave of absence to serve as chief, thermosetting unit, plastics section, chemical division of the **National Production Authority.**

Alfred F. Fields has been named manager of mold manufacture for the plastics division of **General Electric Co.'s Chemical Department.** He joined the firm in 1912.

Elmer French has been promoted to the newly created post of vice president in charge of sales of **Firestone Plastics Co.**, Pottstown, Pa. He joined the parent concern, **The Firestone Tire & Rubber Co.**, in 1941, and became general sales manager of the plastics company when it was organized in 1947.

Charles G. Stupp has been appointed technical director of **The Barrett Div., Allied Chemical & Dye Corp.** He joined the firm in 1916.

C. Richard Newpher, formerly with Reliance Electric & Engineering Co., has joined **Laminated Plastics, Inc.**, as executive vice president in charge of operating functions.

MEETINGS

Sept. 3-13—World Chemical Conclave: the 75th anniversary of the American Chemical Society; 16th Conference of the International Union of Pure and Applied Chemistry; and the 12th International Congress of Pure and Applied Chemistry, Statler Hotel, New York, N.Y.

Sept. 16-19—American Institute of Chemical Engineers, Regional Meeting, Sheraton Hotel, Rochester, N.Y.

Oct. 22-24—American Standards Association, Annual Meeting; and the Second Annual Meeting of the National Standardization Conference, Waldorf Astoria, New York, N.Y.

Nov. 7-9—American Society of Body Engineers, Annual Technical Convention, Rackham Memorial Bldg., Detroit, Mich.

Nov. 19-20—National Metal Trades Association, Annual Convention, Palmer House, Chicago, Ill.

Nov. 26-Dec. 1—Chemical Industries, 23rd Exposition, Grand Central Palace, New York, N.Y.

Dec. 2-5—American Institute of Chemical Engineers, Annual Meeting, Chalfonte-Haddon Hall, Atlantic City, N.J.

Jan. 16-18—Society of Plastics Engineers, Inc., 8th Annual National Technical Conference, Edgewater Beach Hotel, Chicago, Ill.

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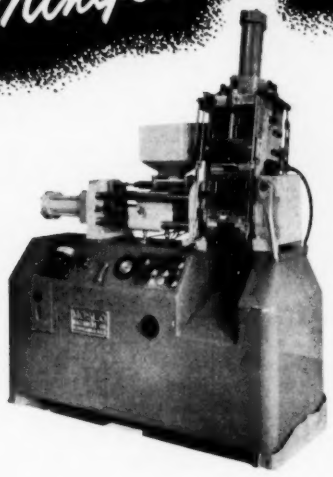

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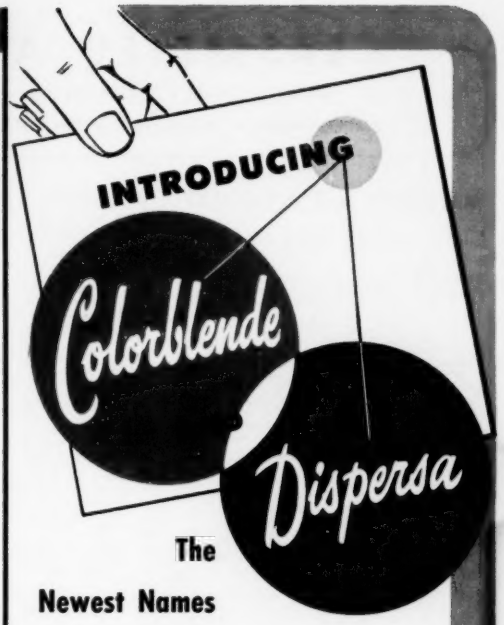

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We invite your inquiry—write today for our price list and Color Comparison Chart. Upon request we will send without charge a sample of any standard color of your choice. "Colorblende" and "Dispersa" are packaged in convenient containers — in 50# or 100# units ready to color your crystal styrene in any mixing drum.

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FOR SALE: 50 Ton Stokes Presses & Pump. 200 Ton W.S. Hobbing PRESS, 300 Ton W.S. PRESS 24 x 20 Platen, 175 Ton H.P.M. PRESS 30 x 30 Platen. 150 Ton Farrel PRESS 30 x 30 Elec. Plates. 140 Ton W.S. PRESS 23 x 17 Platens, 85 Ton Stewart Boiling PRESS 20 x 20 Platen, 50 Ton Elmes PRESS with 18 x 18 Elec. Plates, 75 Ton W.S. PRESS 15 x 15 Platen, 75 Ton Adamson PRESS 20 x 20 Platens. Laboratory presses. Accumulators, Piston and Oil Pumps. AARON MACHINERY CO., INC. 45 Crosby St., N.Y.C.

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Complete equipment for manufacture of styrene Chapel Ring Box including ten cavity mold, long term mechanical and design patents; dies and anvils for hot stamping ornamentation. Item currently selling to jobbers in United States, Canada and Philippines. Sacrifice. Present owner lacks time for proper exploitation. Product adaptable for sale of jewelry, perfume, confections, etc. Reply Box 1165, Modern Plastics.

FOR SALE: 1 Farrel 16" x 42" Rubber Mill complete with drive and 75 H.P. Motor; 1—French Oil Mill 300 ton self contained molding press with pushbacks; 1—125 ton Molding Press, 18" x 18". Also Grinders, Extruders, Compression and Injection Molding Presses. Mixers, etc. Send us your inquiries. Consolidated Products Co., 13-14 Park Row, New York 38, New York.

We handle hydraulic presses, pumps, and power units of all sizes. Write us your requirements and we will try to help you. We find it impossible to list our equipment in this classified column due to the fact that the equipment is sold before ad is published. For those who seek action look in the New York Times under the Machinery and Tool Column for our regular Sunday Special. Hydraulic Sal-Press, Inc., 384-90 Warren Street, Brooklyn 2, N.Y. MAin 4-7847

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MOLDING MACHINE
NEW 1949—$37,500.00
REPLY BOX 1157 MODERN PLASTICS

FOR SALE: NORTH-ERIE ¼ Gal. Laboratory Mixer; 25 Gal. Single Blade Tiltable Blender; 5 Gal. Intensive Mixer with 50 H.P. Motor; New or slightly used equipment available from stock. THE H. W. NORTH COMPANY, 1211 Parade St., Erie, Pennsylvania.

INJECTION MOLDING MACHINES
(in operation)

1½-Oz. IMPCO, new '46, used 3 mo.	$ 4000.00
2-Oz. DeMATTIA, 1941, excellent	$ 1950.00
6-Oz. WATSON STILLMAN ('42)	$ 5950.00
6-Oz. WATSON STILLMAN ('44)	$ 6750.00
8-Oz. REED PRENTICE, Model 10-A ('42)	$ 8500.00
8-Oz. REED PRENTICE, Model 10-D Ser. 21660	$ 8500.00
8-Oz. REED PRENTICE, Model 10-D Ser. 29500	$10,500.00
8-Oz. REED PRENTICE, Model 10-D Ser. 38220	$11,500.00
8-Oz. LEOMINSTER, Ser. #140, excellent	$ 8500.00
9-Oz. H.P.M. Mod. 200-89, Ser. #22690	$ 6950.00
12-Oz. DEMATTIA, Ser. #9-80Hcl. 1946, good	$ 8500.00
16-Oz. IMPCO, Ser. #36720cl.	$15,500.00
22-Oz. REED PRENTICE, new '46, mod. 10-H(2)	$19,500.00
32-Oz. IMPCO converted from 16 oz. to 32 Oz.	$ 2600.00
HYD. COMPRESSION PRESSES	
450 T. H.P.M. new '46 w/turbo, excel.	Offers
350 T. SOUTHWARK 18" St. 24x24" pl.	$ 2975.00
350 T. H.P.M. Self-Cont. new '46	$12,500.00
275 T. W. STILLMAN 2-11" Rams BED 24"x54"; steam platens & 2 Vickers pumps	$ 2975.00
200 T. FARREL 14" ram, 24x24" pl.	$ 1750.00
170 T. BURROUGHS Trans., 14" St. (2)	$ 1850.00
100 T. LA POINTE, Self-Cont. 13" St.	$ 1950.00
75 T. STANDARD '40 Vert. & Horiz.	$ 1975.00
60 T. RECORD PRESS, Self-Cont., 15 avail.	$ 975.00
50 T. WS&JOHNSON, others avail.	$650. up
MISCELLANEOUS	
VICKERS Hyd. Pump Mod. V135, 17 GPM	$ 750.00
B&S Gear Pump & Allis 5 HP 1000 p.s.i.	$ 200.00
PHENOLIC POWDER PLANT, 200,000 per mo.	Offers
STOKES, Mod. DD2, 23 Stat. Rotary, 11/8"x2"	$ 5500.00
SCHUTZ-O'NEIL Pulverizer, 20 HP, #D	$ 950.00
16"x42" FARREL-MILL, 50 HP drive	$ 3950.00

EVEREADY CO. E. J. McCallum, Prop.
805 Housatonic Ave. 4-9471 Bridgeport, Conn.

WANTED: EXTRUDER 3½" to 6" CAPACITY. ALSO RELATED EQUIPMENT AND GRINDING EQUIPMENT.
FISHMAN PLASTICS CO.
6423 WENTWORTH AVE.
CHICAGO 21, ILL.

FOR SALE: One 26-cavity Xmas tree icicle mold with hobs, mounted in D.M.E. base;and one 6-cavity pine cone mold. A-1 condition. Reply P.O. Box 875, Milwaukee, Wis.

FOR SALE: Thermex Preheater, Model 2P; Airtronics Preheater, Model D E; Airtronics Preheater, Model C B. Like new. AARON MACHINERY CO., INC. WOrth 4-8233, 45 Crosby St., New York 12, N. Y.

FOR SALE: 8 Pellet Presses: Kux model 25 (21 punch and 25 punch); Stokes D-3 and D-4. Read Co. 250 gal. heavy duty double arm sigma blade jacketed mixers. PERRY EQUIPMENT CORP.. 1429 N. 6th St., Phila., 22, Pa.

FOR SALE: Peerless Automatic Rotary Table Feed Hot Stamping Press, in excellent condition. Perfection Plastics Engineering Corporation, 2210-20 N. Park Ave., Phila., 32, Pa.

FOR SALE: Injection Presses: 4, 7, 9, 16 oz. HPM, 8, 16 oz. Watson. 2 oz. DeMattia. 22 oz. Lester. 1 oz. VanDorn. Extruders: Lab, 1½", 2½" NRM. Complete extruder setup for Saran Pipe. Cumberland No. O and other scrapgrinders. Several Mold Temp. Controls. 2—Leinke Plasti-Dryers. 4-MisRella Infrared Dryers. Compression Presses: 50, 80, 250 tons. 2—3 HP Gasboilers. 2—Electronic Preheaters. 3 KW. Preformpresses: 1—Kux No. 60, 1—Kux No. 65 B. 1—Nash Rotary Edger. 1—42" Johnstone Slitting & Rewinding machine. 1—51" Sheet Die, Takeup and Cooling unit for 2½" NRM Extruder. 4—Combmolds, for export only. 1—Toy (Boat) mold. Justin Zenner, 823 W. Waveland Ave., Chicago 13, Ill.

FOR SALE: Hannifin L-207 50 Ton air operated platen press—New, never operated. The Vulcan Detinning Company, Sewaren, New Jersey.

FOR SALE: Hydraulic Pumps & Accumulators. Watson Stillman, Wilson Snyder, Baldwin Southworth Vertical Triplex and Horizontal duplex pumps from 55 g.p.m. 2,000 p.s.i. to 500 g.p.m. 1,500 p.s.i. all for direct motor connection. Aldrich & Watson Stillman weighted Accumulators from 14" x 10' 1 000 p.s.i. to 8" x 11' 6" 2,000 p.s.i. Watson Stillman Hydro-pneumatic Accumulator 42" x 18¾" x 48" stroke 250 p.s.i. air—1,300 p.s.i. water. Send for complete listing The Vulcan Detinning Company, Sewaren, New Jersey.

FOR SALE: 4 ounce Reed-Prentice and 1 ounce Moslo, both 1 year old, slightly used. Box 511, Wakefield, Rhode Island.

FOR SALE: 1 oz. Hydraulic Press, excellent condition. N. Y. C., Mu. 3-4621 or Box 1166, Modern Plastics.

FOR SALE: 8 oz. Watson Stillman and 7 oz. H.P.M. Injection also 2 oz. DeMattia can be seen in operation. Detroit Plastic Engineering Co., 7047 E. Eight Mile Road, Base Line, Michigan. Telephone Jefferson 60222.

FOR SALE: Model CBS #129 Doughboy continuous band sealer with conveyor table size 18" wide—94" long—Model BMC #51. Reply Box 1170, Modern Plastics.

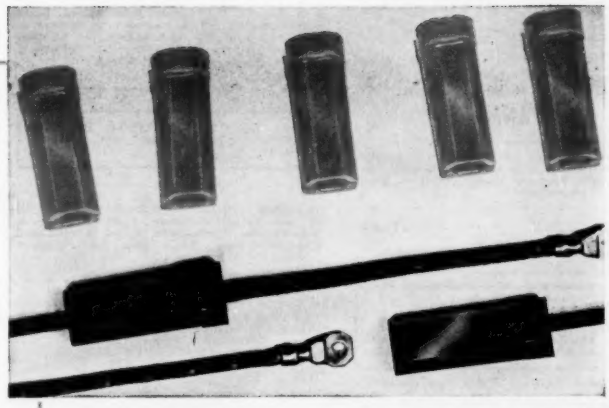
MACHINERY and EQUIPMENT WANTED

MOLD WANTED for injection molding. We will buy one mold or a complete line or series of molds for finished resalable items. Housewares, toys, novelties, etc. Will also buy molds for industrial parts such as handles, knobs, drawer pulls, gears. All items for resale in U. S. A. Send detailed information to Victory Manufacturing Company, 1722 W. Arcade Place, Chicago 12, Illinois.

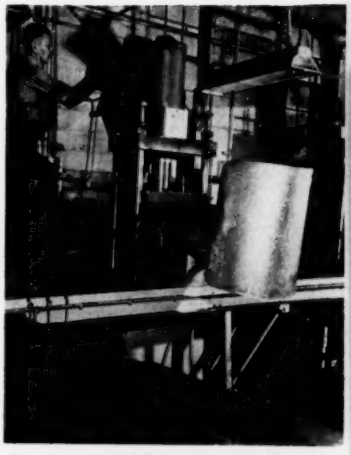
(*Continued on page 212*)

Automatic Molding

...cuts labor
...cuts costs
...cuts investment



Plastic Insulators for electrical connections, shown in connected and disconnected positions, used in quantities for lighting and other connections on automobiles . . . made by Wade on Stokes Presses.



One of the Stokes 741 fully automatic molding presses at Wade Electric Products Company, Sturgis, Michigan. Parts drop on conveyor belt, thence to tumbler. Occasional filling of hopper is the only regular attention required.

Each unit in this installation of Stokes 741 automatic molding presses produces approximately 40,000 parts per hour which are automatically conveyed to a tumbler to remove flash.

The part is an insulator for an electrical connector, small but complex, previously considered impossible to produce automatically.

The Stokes 741 fully automatic molding press assures high production of perfect, uniform parts, and takes the place of a large plunger press with its preform press, electronic preheater, and the full-time and part-time operators required to run it.

In automatic operation one man periodically fills the hoppers with molding powder and removes the finished parts; otherwise no attention is needed.

Let Stokes experts judge from parts or blueprints if your products qualify—or can easily be re-designed for—the high production and large savings per unit which are possible by automatic molding. Or send for a 24-page brochure on Fully Automatic Molding.

STOKES

STOKES MAKES
Plastics Molding Presses,
Industrial Tableting
and Powder Metal Presses,
Pharmaceutical Equipment,
Vacuum Processing Equipment,
High Vacuum Pumps and Gages,
Special Machinery

F. J. STOKES MACHINE COMPANY, 5004 TABOR ROAD, PHILADELPHIA 20, PA.

CLASSIFIED ADVERTISING

(Continued from page 210)

MACHINERY and EQUIPMENT WANTED

WANTED: Defiance #20 Preform Press. Also, one 15 ton Stokes fully automatic molding machine. Plastic Products, Inc., Pine Street, South Norwalk, Connecticut.

WANTED TO BUY: 3½", 4½" or 6" STANDARD PLASTIC EXTRUDER. REPLY BOX 1154, MODERN PLASTICS.

INJECTION MOLDING MACHINE WANTED
24 ounce or larger. Write Mr. Wm. Golden, Beacon Plastics Corp., 82 Needham Street Newton Highlands 61, Mass. Decatur 2-1322.

MATERIALS FOR SALE

FOR SALE: ALL GRADES OF THERMOPLASTIC REGROUND OR VIRGIN. YOUR INQUIRY HANDLED PROMPTLY.
FISHMAN PLASTICS CO.
6423 WENTWORTH AVE.
CHICAGO 21, ILL.

FOR SALE: Natural, virgin, unopened, nylon injection molding material. Will sell or trade for virgin clear or white polystyrene. Reply Box 1160, Modern Plastics.

FOR SALE: 6,200 lbs. 18"—.004 Polyethylene Tubing. 1,400 yds. 48"—.004 Peach Color Plastic Film. 8,000 yds. 35/36" Quilted Firestone Beautafilm .004 Plastic, Polyethylene on back. Colors: blue, red, green, yellow and white. 26,580 Zippers 17" on white tape #961 Wilzip and Serval. 1,129 Wilzip 23"—680 Talon 24" white tape. 974 Crown #5 Gilt 12" Brown Tape. Reply Box 1171, Modern Plastics.

FOR SALE: Approximately 2000# Rohm and Haas Plexiglass VM639 Pink Medium Flow Powder. Heckman Company, St. Louis 11, Missouri.

FOR SALE: Crystal Clear, Printed, and Assorted Colors Cellulose Acetate sheet scrap, 20,000 lbs. spot delivery, also regular supply. Box 1173, Modern Plastics.

MATERIALS WANTED

WANTED: PLASTIC Scrap or Rejects in any form. Acetate Butyrate, Polystyrene, Acrylic, Vinyl Polyethylene, etc. Also wanted surplus lots of phenolic and urea molding materials. Custom grinding, magnetizing and compounding. Reply Box 1161, Modern Plastics.

WE BUY SCRAP PLASTICS, POLYETHYLENE, POLYSTYRENE, CELLULOSE, ACETATE, VINYLBUTYRATE. Have new method for coloring and processing your scrap plastics at substantial savings to you. CALL, WRITE, WIRE GEORGE WOLOCH CO., 61 BROADWAY, NEW YORK 6, N. Y. HAnover 2-1175.

WANTED: Plastic scrap, rejects, and surplus molding compounds, such as Cellulose Acetate, Vinyls, Acrylic, Ethyl Cellulose, Polystyrene, Butyrate, etc. Also custom grinding, cleaning, and reprocessing of your own plastic scrap. Reply Claude P. Bamberger, Inc., 228 Wooster St., New York 12, N. Y. Tel: SPring 7-0933.

WANTED: Rigid Vinyl scrap in any form. Will purchase on contract basis if desirable as we are steady users. Reply Box 1172, Modern Plastics.

WANTED: Plastic Scrap, Rigid Vinyl, Cellulose Acetate, Polystyrene, Polyethylene, Butyrate, Custom grinding, magnetizing, compounding, and straining of contaminated plastics. Franklin Jeffrey Corporation, 1671 McDonald Avenue, Brooklyn, N. Y. ES 5-7943.

SURPLUS UREA MOLDING POWDER WANTED. Reply Box 1184, Modern Plastisc.

WANTED: PLASTIC SCRAP or REJECTS in any form: Cellulose Acetate, Butyrate, Polyethylene, Polystyrene, Vinyl, Acrylic and Ethyl Cellulose. Reply Box 1162, Modern Plastics.

WANTED: ALL GRADES OF THERMOPLASTIC MATERIALS IN ANY SHAPE OR FORM. SCRAP—REGROUND OR VIRGIN
FISHMAN PLASTICS CO.
6423 WENTWORTH AVE.
CHICAGO 21, ILL.

MOLDS FOR SALE

FOR SALE: Three-piece unique plastic desk piece, including patent rights, three injection molds, approx. 6400 completed sets. Owner must devote full time to die business. Market proven by retail survey. Excellent opportunity for firm with distribution. D. E. Brewer, 1132 Meadowbrook Drive, Inkster, Michigan.

FOR SALE: One—twenty cavity injection mold for two inch ball mold. Ten complete balls or twenty halves. One-two cavity injection mold for Canasta tray. One C & B Polyethylene die try machine. For information, write to J. Neuman, 1800 W. Berenice, Chicago, Illinois.

FOR SALE: Field Glass in styrene with acrylic lenses. Body mold of oil hardened steel, chrome plated hobbed cavities, makes four units at one shot. Stainless steel lens mold makes twenty-four lenses at one shot. Molds make for Reed and Prentice 8 ounce machine. Molds virtually new. The Spartan Corporation, 2900 Emerson Avenue South, Minneapolis 8, Minnesota.

MOLDS WANTED

WANTED: Molds for injection molding of toys, novelties and housewares which have sold successfully in the U.S., for use in foreign countries. Describe molds, with sample of article and lowest quotation. Box 1169, Modern Plastics.

WANTED—USED MOLDS
Seeking all types of Injection and Compression molds in good condition for use abroad; purchase outright or royalty basis. DAVID ROME ASSOCIATES, 350 5th Ave., NYC, CH. 4-4170.

WANTED: Used Compression Molds for the manufacture of electrical accessories and wiring devices, such as plugs, receptacles, sockets, and all other types. Reply Box 1168, Modern Plastics.

WANTED: Compression Molds for electric wiring devices and wall plates. Must be in good condition. Give details. For Export only Write: Box 1167, Modern Plastics.

HELP WANTED

PLASTICS RAW MATERIALS MANUFACTURER seeks experienced young man for buying and selling. Must be willing to travel. Salary open. Write, stating complete background and qualifications. Replies held strictly confidential. Our employees know of this ad. Reply Box 1156, Modern Plastics.

PLANT MANAGER to take complete charge of modern and progressive compression and injection molding plant located in Texas. The position requires a man with experience and ability in mold design, estimating molds and piece price, complete familiarity with materials, machines, molding techniques and finishing operations of present day plastics. Ability to supervise and handle employees essential. Salary commensurate with experience and ability. This is an excellent opportunity for the right man. Our employees are aware of this ad. Reply stating age, experience and salary desired to Box 1158, Modern Plastics.

WANTED: A sales executive with a following in industrial molding. An excellent opportunity to build a secure future for yourself. Our salesmen know this advertisement is being placed. Reply Box 1155, Modern Plastics.

WANTED—CHEMIST: Latex compounding or Vinyl Plastisols for dipping and casting. Unusual opportunity for top man. Salary open. Brooklyn concern. Our men know of this ad. Box 1176, Modern Plastics.

PLASTIC INJECTION MOLDING FOREMAN WANTED
Excellent opportunity for working foreman to take complete charge of new molding plant located southern Michigan. Permanent position with old established AAAI manufacturer. Must be fully capable of setting and maintaining machines, training help. Mold repair background desirable. Write complete details first letter.
Reply Box 1175, Modern Plastics

PLASTICS ENGINEERS: Must be experienced in injection, compression and extrusion molding. Travel and/or residence abroad necessary. Complete details; age, education, experience, salary requirements, should be incorporated in first reply. DAVID ROME ASSOCIATES, 350 5th Ave., NYC, CH. 4-4170.

PLASTIC INJECTION MOLDER-FABRICATOR, seeks sales representatives in key industrial areas in midwest and on east coast. Generous commission arrangement. Reply Box 1174, Modern Plastics.

WANTED: Hi-grade injection molding foreman; must be thoroughly familiar with all mechanical and technical phases of injection machines and molds. New small plant with excellent potential located in western Massachusetts. Unless you are good practical hard worker do not apply. Good salary for right man. Write giving background and experience. Box 1177, Modern Plastics.

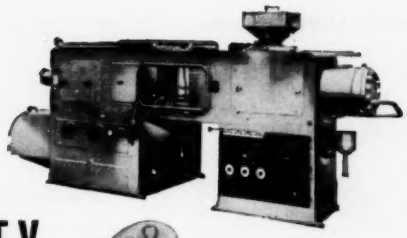
CUSTOM injection molding sales representative wanted. New York area, progressive, 12 machine plant, all facilities, commission basis. Experienced only. Submit complete information. All replies held confidential. Box 1178, Modern Plastics.

(Continued on page 214)

All classified advertisements payable in advance of publication

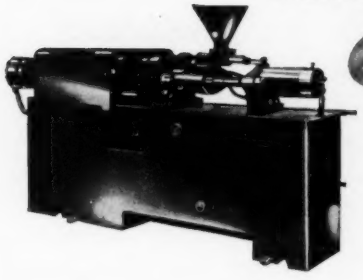
Up to 60 words $7.50	Up to 120 words $15.00	Up to 180 words $22.50
Up to 60 words (boxed) ... $15.00	Up to 120 words (boxed) ... $30.00	Up to 180 words (boxed) ... $45.00

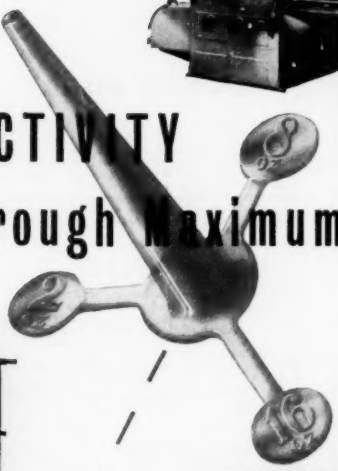
For further information address Classified Advertising Department, Modern Plastics, 575 Madison Avenue, N. Y. 22, N. Y.

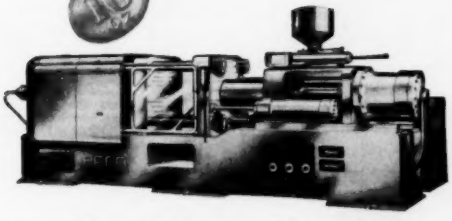


HIGH PRODUCTIVITY

Through Maximum Efficiency







PECO Injection Moulding Machines

The Projectile & Engineering Co. Ltd. manufacture a range of Injection Moulding Machines from 2 oz. to 16 oz. capacity, designed to meet the most exacting requirements of the Plastic Industry. They are self-contained with automatic cycle, and hydraulically operated. They have a high plasticising capacity and rate of injection. Mould-locking pressure and platen area enable them to operate at a high rate of production.

MOULDS

PECO MOULDS. Expert Designers and mould makers are employed and moulds can be supplied to samples submitted, including die-sinking models if desired. An important side of the Company's work is the hobbing of cavities for moulds and medallions — the plant includes a 3,000-ton Hobbing plant. Master hobs to customers' samples made as required.

Full particulars of our range of Injection Moulding Machines and Moulds will be sent on request.

PECO PROJECTILE PRODUCTS

The PROJECTILE & ENGINEERING COMPANY LIMITED

ACRE STREET, BATTERSEA, LONDON, S.W.8, ENGLAND

Telephone: Macaulay 1212 Telegrams: "Profectus, Claproad, London" Cables: Profectus, London

CLASSIFIED ADVERTISING

(*Continued from page 212*)

HELP WANTED

Large Midwestern Proprietary Molder needs two men for expanding compression and injection molding operations:

First opening requires man with experience and ability in mold design, material specification, estimating mold and piece price, complete familiarity with materials, machines, molding techniques and finishing operations for present day plastic materials: Ability to supervise and head up department doing this work with experience in customer contact desirable. Salary depends upon experience and ability.

We have an opening also for experienced mold and molding technician: Man we need must be capable of taking new mold and working up standard operating cycles completely with a minimum of supervision. Thorough knowledge of materials and molding techniques necessary. Time study experience and knowledge of inspection methods desirable.

Send complete details and work record with first application. Reply Box 1180, Modern Plastics.

COATER ENGINEER OR FOREMAN—Excellent opportunity for experienced man to assume responsibility over new department being set up in old, established firm. Experience necessary with organisols and plastisols. Reply stating all personal qualifications and business experience. All replies confidential. Reply Box 1164, Modern Plastics.

CHEMIST, for Vinyl Sheeting & Film plant. Only men with extensive experience need apply. Excellent opportunity. Reply Box 1182, Modern Plastics.

WANTED: Graduate engineer with approximately five years experience in testing or application of plastic materials, primarily thermosetting and thermoplastic molding materials and laminates, having a good knowledge of their physical properties. Position in Plastics Laboratory of large New York State manufacturer of precision electro-mechanical devices. Send full details of education and industrial experience. Reply Box 1163, Modern Plastics.

SITUATION WANTED

PLASTICS CHEMIST. Age 33. Ph.D., 9 years experience in cellulose acetate and polystyrene plastics, polymer, molding powder, sheet and film manufacture. Author of book and other publications. Desires responsible appointment. Executive, development or research. Any location. Reply Box 1158, Modern Plastics.

VINYL TECHNICAL MANAGER, age 35—Film, sheet, extrusions, coated fabrics. Executive, with leading converter and distributor. Thoroughly acquainted with entire Vinyl Industry. Development; Quality Control; built and maintain testing laboratory; specifications; fabrication; printing; coating; laminating; troubleshooting; technical sales liaison; direct contact with customers. Committee Member S.P.I. Listed "Who's Who In Plastics". Many years Plastic Industry. New York area only. Reply Box 1159, Modern Plastics.

PLASTICS ENGINEERING OR MANAGEMENT. Energetic, personable engineer with ability to produce results. Ten years of diversified industrial experience: development, design, production, and sales. Extensive knowledge of honeycomb and polyester laminates, extrusion and injection molding, coated fabrics, polymerization, etc. Chemical Engineer (BSE), Mechanical Engineer (MS), Age 33. Write: 1132 Beech Street, South Pasadena, California.

Situation wanted as PLASTIC INJECTION MOLDING PLANT MANAGER. Intelligent hard worker, with 8 years injection molding experience, thoroughly reliable, married, age 29, desires position as supervisor or manager of small plant. Fully familiar with all phases of plant operation, set-up and maintenance of machines, molds, organizing personnel, etc. Presently in charge of injection molding department, but seeking better opportunity. Best references. Reply Box 1179, Modern Plastics.

General Manager, age 41, having had 18 years experience in the research development, manufacturing, sale and application of vinyl coatings, desires executive position with established firm. Now President and General Manager of corporation, and for personal reasons wishes to make a change. Has outstanding ability as business and sales executive. Western or midwestern location desired. Starting salary $10,000. Reply Box 1181, Modern Plastics.

MISCELLANEOUS

Inventions Wanted: First-Class manufacturer wants inventions using plastics and steel. We can build the molds and dies, run the production, and sell your product. Also interested in buying established businesses. Will pay royalty on existing manufacturing items that we can manufacture and sell. Write Albert E. Payne, owner-manager, THE PAYNE TOOL AND ENGR. CO., SPRINGFIELD, OHIO. Strictly confidential.

Experienced engineering sales organization offers Midwest molder and extruder profitable sales representation Atlantic seaboard. Commission basis only. Technical Product Company, 369 Lxington Avenue, N. Y. C.

INDEX OF ADVERTISERS

SEPTEMBER 1951

Accurate Molding Corp. 138
Acheson Colloids Corp. 167
Acromark Co., The 190
Acryvin Corp. of America 148
Adamson United Company 139
Aldrich Pump Co., The 32
Allied Chemical & Dye Corp., The Barrett Div. 121
American Anode, Inc. 47
American Cyanamid Co., Plastics Dept. 108, 109
American Cyanamid Co., Industrial Chemicals Division 159
American Insulator Corp. 74
American Molding Powder & Chemical Corp. 133
American Wheelabrator & Equipment Corp. 156
Amplex Manufacturing Co. 155
Anderson Bros. Mfg. Co. 138
Associated Plastic Companies, Inc. 62
Atlas Valve Co. 173
Avery Adhesive Label Corp. ... 24
Argus Chemical Laboratory 205

B. I. P. Tools Limited 48, 203
Bailey, R. N., & Co., Inc. 146
Bakelite Company, A Div. Union Carbide & Carbon Corp. 55, Inside Back Cover
Baker Bros., Inc. 161
Ball & Jewell, Inc. 18
Bamberger, A., Corp. 36
Barrett Div., Allied Chemical & Dye Corp. 121
Bethlehem Steel Co. 20
Black-Clawson Co., The, Dilts Machine Works 171
Boonton Molding Co. 64
Borden Co., The, Chem. Div. .. 58
Bridgeport Moulded Products, Inc. 12
Brown Co. 147
Brunswick-Balke-Collender Co., The 26, 27
Buttondex Corp. 147

Cabot, Godfrey L., Inc., ... 142
Cambridge Instrument Company 175
Carpenter Steel Co., The 51
Carver, Fred S. Inc. 167
Catalin Corp. of America 1
Celanese Corp. of America, Plasties Div. 9
Chicago Molded Products Corp. 4
Classified 210, 212, 214
Claremont Waste Mfg. Co. 175
Clopay Corporation 169
Conforming Matrix Corp. 179
Continental Can Co. 34, 35
Continental Screw Co. 67
Crucible Steel Co. of America .. 28
Cruver Mfg. Co. 16
Crystal Plastics, Inc. 146
Cumberland Engineering Co. Inc. 25

Dilts Machine Works, The Black Clawson Co. 171
Dow Chemical Co., The 197
Drakenfeld, B. F., & Co., Inc. .. 135
DuBois Plastics Products, Inc. .. 168
duPont de Nemours, E. I., & Co., (Polychemicals Dept.) 7
duPont de Nemours, E. I., & Co., (Electro Chem. Dept.) 181
Durez Plastics & Chemicals, Inc. 76, Inside Front Cover

Eagle Tool & Machine Co. 175
Eastman Kodak Co., Cellulose Prods. Div. 123
Electric Auto-Lite Co., The Instrument & Gauge Div. 157
Erie Engine & Mfg. Co. 135
Erie Resistor Corp. 19
Erinoid Ltd. 39

Fabricon Products, Inc. 162
Farrel-Birmingham Co., Inc. 43
Fellows Gear Shaper Co. 59
Ferro Chemical Corp. 174
Ferro Enamel Corp. 138
Fiberite Corp. 143
Flambeau Plastics 185
Flexfirm Products 165
Formica Co., The 144, 145
French Oil Mil Machinery Co. .. 163

Geissel Mfg. Co., Inc. 179
General Electric Co. .... Back Cover
General Industries Co. 71
General Tire & Rubber Co. .. 56, 57
Gering Products, Inc. ..50, 143, 163
Glidden Co. 45
Goodrich, B. F., Chemical Co., The 3
Goodyear Tire & Rubber Co., The 21, 33

Hardesty Chemical Co. 155
Hercules Powder Co. 69
Heyden Chemical Corp. 149
Hinde & Dauch Paper Co., The 65
Hobbs Mfg. Co. 133
Hommel, O., Company, The .. 160
Hydraulic Press Mfg. Co., The .. 53
Hy-Pro Tool Co. 137

Iddon Bros., Ltd. 44
Ideal Plastics Corp. 22, 23
Improved Paper Machinery Corp. 157
Industrial Heater Co., Inc. 155
Industrial Research Labs. Ltd. .. 170
International Textile Co. 189

Jackson & Church Co. 60, 61
Jeffrey, Franklin, Corp. 164
Jones, C. Walker, Co. 136

Kentucky Color & Chemical Co., Inc. 181
Kingsley Stamping Machine Co. 164
Koppers Co., Inc. 49

Lane, J. H., & Co., Inc. 172
Lembo Machine Works, Inc. .. 172
Lester-Phoenix, Inc., ... 31
Lewis Welding & Engineering Corp. 132
Lind Plastic Products Co. 160
Libbey-Owens-Ford Glass Co., Plaskon Div. 103

Manco Products Co. 179
Manufacturers' Literature 183, 184
Marblette Corp. 112
Marvel Engineering Co. 46
Mayflower Electronic Devices .. 205
Mearl Corp., The 162
Mears-Kane-Ofeldt, Inc. 194
Metaplast Process, Inc. 170
Metasap Chemical Co. 8
Michigan Chrome & Chemical Co. 167
Michigan Molded Plastics, Inc... 189
Mico Instruments Co. 136
Mid-America Plastics Inc. 209
Midland Die & Engraving Co. .. 100
Mills, Elmer E., Corp. 37
Minnesota Plastics Corp. 41
Mitts & Merrill 166
Modern Plastic Machinery Corp. 13
Molded Products Corp. 38
Molded Resin Fiber Co. 150
Monsanto Chemical Co., Organic Chemicals Div. 29
Monsanto Chemical Co., Plastics Division 63
Mosinee Paper Mills Co. 125
Moslo Machinery Co. 209
Muehlstein, H., & Co. 135

National Rubber Machinery Co. 127
Naugatuck Chemical Co. .. 66, 151
New England Lacquer 195
New Hermes, Inc. 173
Newark Die Co. 166
Nixon Nitration Works 10
Nordan Plastics Corp. 177
Northern Industrial Chemical Co. 143
Norton Labs., Inc. 199

Orange Products, Inc. 171

Parker-Kalon Corp. 30
Plaskon Division, Libbey-Owens-Ford Glass Co. 103
Plastic Engineering Co. 42
Plastic Molding Corp. 178
Plastic Research Products, Inc. 200
Preis, H. P., Engraving Machinery Co. 205
Progressive Machine Co. 192
Projectile & Engineering Co., Ltd., The 213

Quinn-Berry Corp. 193

Recto Molded Products, Inc. .. 177
Reed-Prentice Corp. 11
Reichhold Chemicals, Inc. 141
Richardson Co., The 6
Rogers Corp. 40
Rohm & Haas Company 117
Royle, John & Sons 177

Safety Car Heating & Lighting Co. 171
Santay Corp. 128, 129
Schulman, A., Inc. 157
Schulz, R. O., Co. 214
Schwartz Chemical Co. 147
Scott Testers, Inc. 190
Scranton Plastic Laminating Corp 192
Shell Oil Co. 72, 73
Silleocks-Miller Co. 163
Sinko Mfg. & Tool Co. 147
Standard Tool Co. 148
Stanley Chemical Co. 182
Sterling Electric Motors, Inc. .. 185
Stokes, F. J., Machine Co. 211
Stricker-Brunhumer Corp. 133
Styrene Products, Ltd. 39
Synthane Corp. 17

Tennessee Eastman Co. 131
Thermo Electric Co., Inc. 136
Timken Roller Bearing Co. 54
Titanium Pigment Corp. 70
Tumb-L-Matic 180
Tupper Corp. 52

Union Carbide & Carbon Corp. Bakelite Co. 55, Inside Back Cover
United States Gasket Co. 188

Van Dorn Iron Works Co., The 153
Vere Engineering Co., Ltd. 186, 187

Waterbury Companies, Inc. 154
Watertown Mfg. Co. 134
Watlow Electric Mfg. Co. 194
Watson-Stillman Co. 14, 15
Westchester Plastics, Inc. 191
Western Felt Works 190
Wheelco Instruments Co. 160
White, S. S., Dental Mfg. Co. .. 181
Windsor, R. H., Ltd. 207
Witco Chemical Co. 119
Woloch Co., George 195
Wood, R. D. & Co. 195
Worcester Moulded Plastics Corp. 216

Zenith Plastics Company ... 26, 27

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